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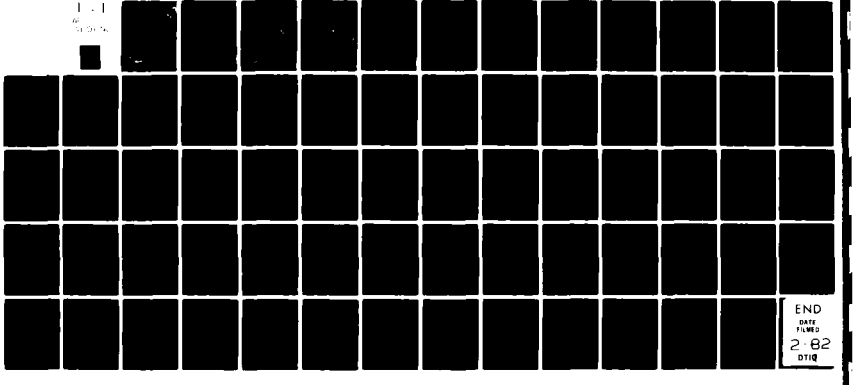

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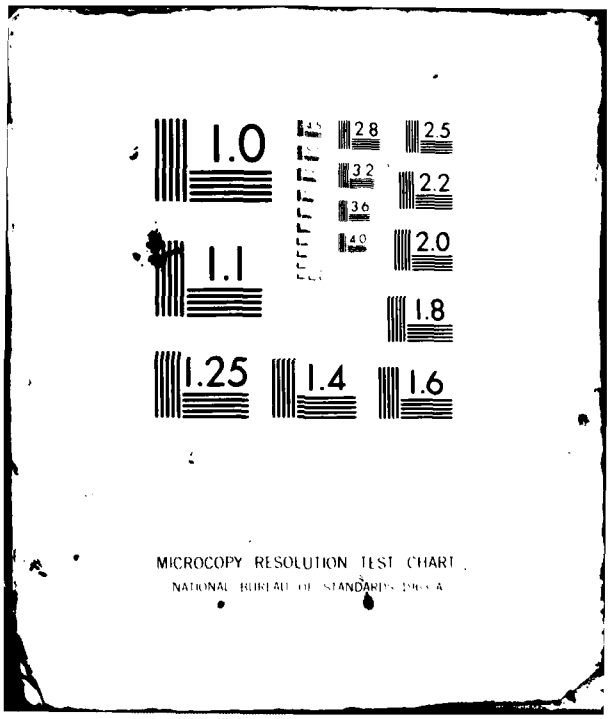
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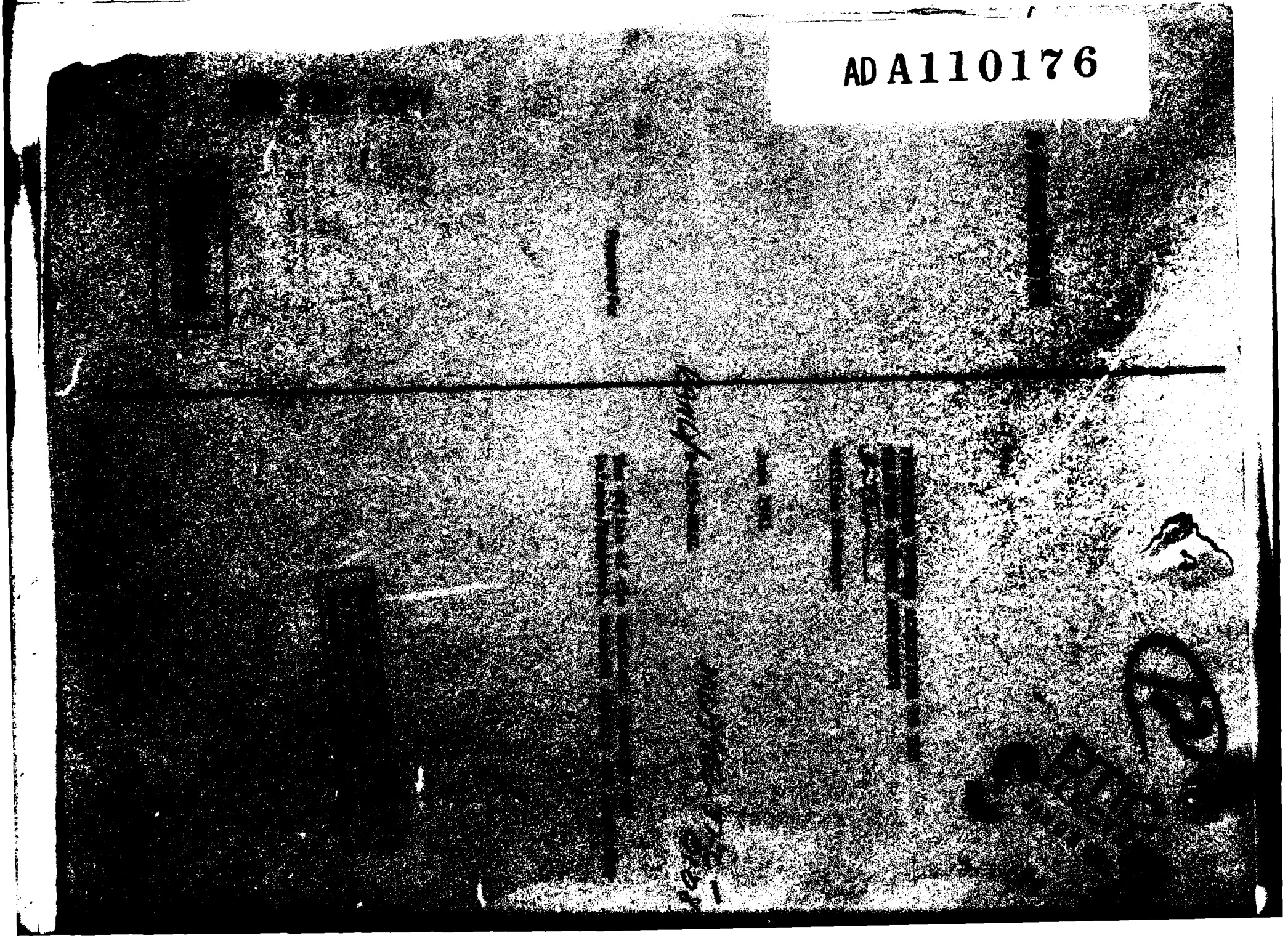

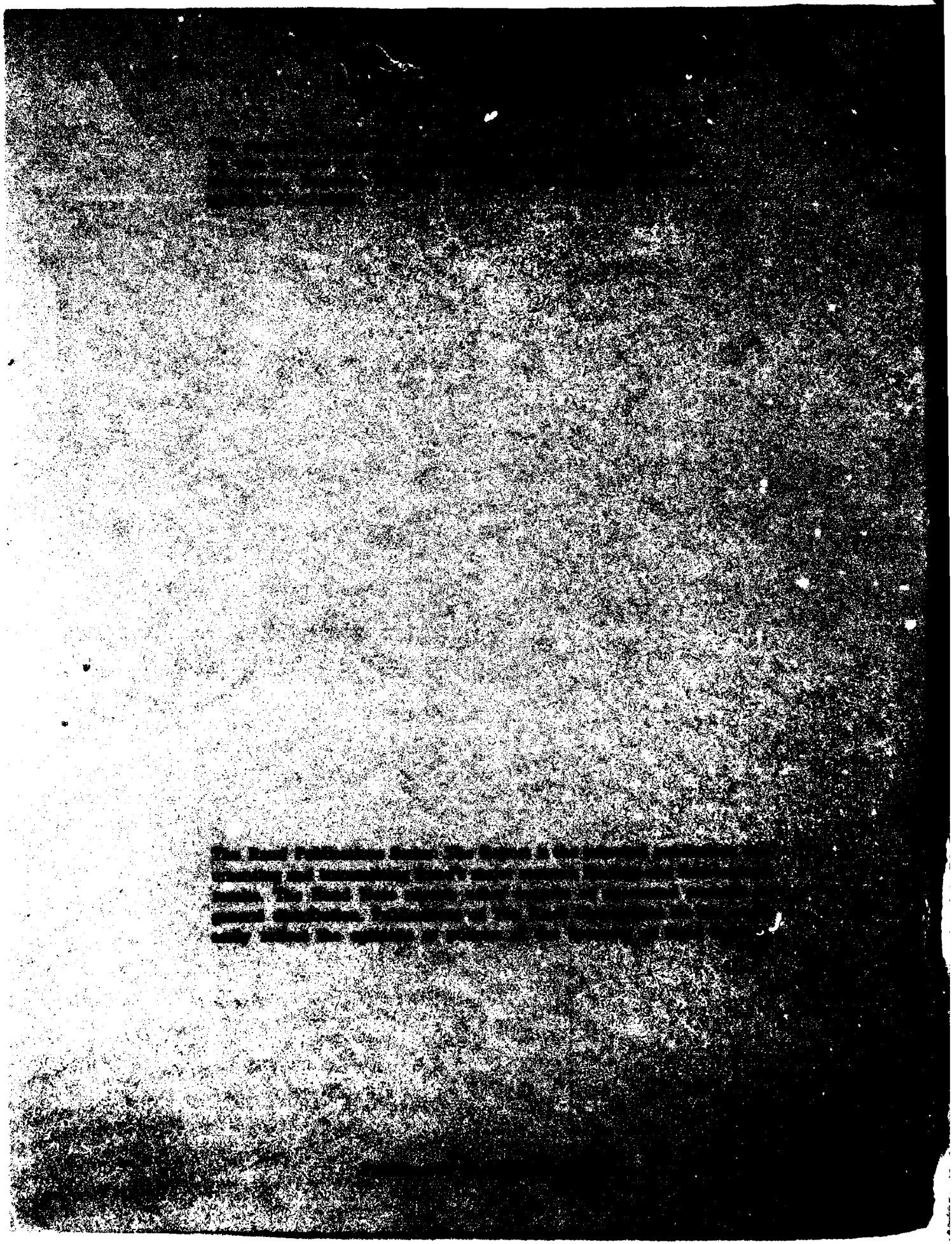

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A RAND NOTE

PROJECTING FUTURE ACCESSIONS TO THE SELECTED RESERVE COMPONENTS

William McNaught

June 1981

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Presents projections of the number of non-prior service and prior service accessions to the selected reserve forces during the 1980s. The methodology used here improves upon prior projection techniques by recognizing the impacts which unemployment variations will have on future enlistment propensities. The accessions projections themselves are lower than those previously constructed. This suggests that the strength forecasts used by the Defense Department in their report on the future of the All-Volunteer Force may be too optimistic. 53 pp. (Author)

PREFACE

This note was prepared under Task Order 79-III-1, Reserve Supply, as part of Rand's Manpower, Mobilization and Readiness Program, sponsored by the Office of the Assistant Secretary of Defense (Manpower, Reserve Affairs and Logistics)--OASD(MRA&L).

With manpower issues assuming an ever greater importance in defense planning and budgeting, this program seeks to develop broad strategies and specific solutions for dealing with present and future defense manpower problems. The program includes the development of new methodologies for examining broad classes of manpower problems, as well as specific problem-oriented research.

This note discusses an improved methodology for forecasting future accessions to the DoD Reserve Components. This methodology represents an initial step in the process of improving the accuracy of reserve accession forecasts. When combined with the richer data bases created over time as reserve personnel accounting systems improve, methodologies like this one will assist OASD-(MRA&L) policymakers in assessing the future viability of the all-volunteer force.

SUMMARY

The undermanning of Army Selected Reserve Units has been one of the problems encountered by the Defense Department in managing the all-volunteer force. Recent DoD analyses have predicted that Selected Reserve strengths would increase during the 1980s because of increased reenlistment rates. However, this prediction assumes that Selected Reserve enlistments do not decline from current levels. Since the two manpower pools from which Selected Reserve accessions are drawn will both decline in the 1980s, improved forecasts of future accession are a vital part of accurate reserve strength projections.

This note describes an initial attempt to monitor and project Reserve accessions and to determine the causes of changes in accession levels between 1973 and 1979. We find that (1) national unemployment rates significantly affect the accession rates of NPS personnel and (2) PS accession rates are less sensitive than NPS to unemployment changes.

The estimated sensitivity of accession rates to unemployment changes, as measured by an *unemployment elasticity*, serves as a key parameter for improved projections of future reserve accession levels. Combining estimated unemployment elasticities with unemployment and population trends we predict decreases in reserve enlistments through the 1980s. These decreases result principally from the shrinkage in the pool of personnel eligible for each type of reserve enlistment. The pool of civilian youths eligible for NPS enlistment declines because of demographic factors; the pool of veterans eligible for PS enlistment declines because of the decrease in active force levels.

Since the major new DoD reserve recruiting program did not start until 1979, the present analysis cannot address the effectiveness of these programs. However, a comparison shows these projections underestimate actual accessions in 1979 and 1980. This comparison offers some evidence that these programs may be attracting additional enlistees. Further research, which would build on the present work and include data for these additional years, could provide a more accurate assessment of the effectiveness of these programs.

ACKNOWLEDGMENTS

I wish to thank all those who contributed to this effort: David Grissmer, James Hosek, Robert Roll, and Burke Burright, all of whom offered helpful suggestions which improved the analysis; Lieutenant Colonel D. L. McCabe of OASD(MRA&L), who aided in the data collection; and Catherine Boyd, who painstakingly assembled and checked the data.

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I. INTRODUCTION

The transition to the All-Volunteer Force (AVF) has sparked a continuing debate in the United States on the advisability of doing without the draft. One of the important issues being debated is whether the Reserve Components can be manned adequately without resort to a draft of personnel, either directly into the reserves or into the active components which would induce enlistments into the reserves of those seeking to avoid active service.

A recent Defense Department report* singled out undermanned Army Selected Reserve Units as a "specific problem area" in the all-volunteer force. The analysis of Selected Reserve strength in Chapter 5 of that report indicated high turnover rates, rather than low accession levels, to be the principal cause of the observed declines in Selected Reserve strengths. Much of this turnover, however, can be attributed to excessive reliance on prior service (PS) accessions, who enlist for only a single year, as opposed to non-prior service (NPS) accessions, who typically enlist for 6 years. Also, as the supply of prospective recruits has shrunk with abolition of the draft, quality and motivation changes have combined to decrease the percentage of NPS enlistees who complete their initial term of service.

DoD force projections cited in the AVF Report** indicate that Selected Reserve strengths, which hit bottom in FY77, would in most cases climb throughout the 1980s---even without further DoD action to combat the problem. Growing reserve strengths will result principally from an expected increase in reserve reenlistment rates as all draft-motivated personnel depart the reserves.

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*_America's Volunteers: A Report on the All-Volunteer Armed Forces_, Office of the Assistant Secretary of Defense (Manpower, Reserve Affairs and Logistics), December 31, 1978, p. 139. This report is commonly known as the AVF Report.

**AVF Report, Table 5-9, p. 116.

These same projections assume that the accessions to the Selected Reserve components will decrease during the 1980s. First, the pool of youth eligible for NPS elistment* will begin to decline in 1981. Second, the veteran population, from which PS accessions are drawn, will begin to shrink as the active forces continue at reduced peacetime levels and shift to force structures employing larger proportions of senior personnel.

Previous reserve accession projection models do not include other factors which may affect reserve accessions in the 1980s. These factors include economic conditions, such as youth wage rates and levels of unemployment, new reserve education and compensation incentives and additional reserve recruiting efforts. Time series regression analysis is the most straightforward method for incorporating these additional factors into the projection methodology. Unfortunately, historical data is only available beginning in 1973. None the less, it is important to begin the development of these reserve regression models so the accuracy of projections can be ascertained and the model refined as more data become available.

This note describes a regression analysis of reserve accessions in the 1973-1979 period. Information from this analysis is then used to project accessions in the period 1979-1990. Section II of this note reviews the theory behind the equation specification adopted here. Section III first estimates the reserve supply equations and then discusses the significance of the estimated coefficients. Section IV constructs the reserve accessions projections. Finally, Section V discusses future reserve strengths in light of these new gain projections.

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*For purposes of this note, we define the pool for NPS accessions to be the total population of 17 to 24 year old males. About 25 percent of the NPS recruits are women, and about 15 percent of Selected Reserve recruits are 25 years or older. For PS enlistees, we define the pool as the total population of Vietnam-era veterans.

Three major conclusions emerge from this analysis: First, the supply of non-prior service reservists is sensitive to national unemployment rates. Second, current reserve projection models must be used with caution since they do not include several factors which will impact reserve enlistment in the 1980s. Third, enlistments in 1979 and 1980 were significantly higher than projected. One explanation for this increase is the new reserve accessions programs initiated in 1979.

II. THE THEORY OF RESERVE SUPPLY

Analysts have yet to agree on a theory of reserve supply behavior. Because the limitations of this note preclude the development of a well-tested model of reserve supply behavior, the analysis uses instead a simple theory based on elements of existing theories of military occupational choice and secondary labor market participation.

A number of studies have investigated the supply of personnel to the military services during the past 15 years. Alan Fechter reviews them and discusses the theory behind their specifications in Chapter II of *Econometric Models of Armed Forces Enlistment Levels*.* Fechter concludes that most analysts agree on a specification containing the following:

$$A = f(M,C,U,P,D,X) \qquad \text{(Eq. 1)}$$

where A is accessions,
M is military pay,
C is civilian pay,
U is unemployment rate,
P is the size of the eligible population,
D is draft pressure, and
X may include a variety of other variables, such as recruiting effort, seasonal or regional dummies, and time trends.

Testable hypotheses derived from this model are:

$$\partial A/\partial M > 0 \qquad \partial A/\partial C < 0 \qquad \partial A/\partial U > 0$$

This active force model can be extended to analyze reserve supply behavior. For persons contemplating reserve enlistments, there are two important civilian pay levels. One is the wage of the primary job; the

*Dorothy M. Amey, Alan E. Fechter, Daniel F. Huck, and Kenneth D. Midlam, *Econometric Models of Armed Forces Enlistment Levels*, General Research Corporation, OAD-CR-160, October 1976.

other the wage of alternative secondary jobs. Robert Shishko and Bernard Rostker performed a sophisticated analysis of the moonlighting decision by civilian workers.* They showed theoretically that a change in primary wages may increase or decrease the propensity to moonlight. If leisure time is a superior good, i.e., if more of it is consumed as income increases, then the effect should be negative and propensities should decrease as primary wages increase. Empirical estimation of a secondary job model confirmed this supposition. Thus a more complete theory of reserve supply is:

$$A = f(M, C_p, C_s, U, P, D, X) \qquad \text{(Eq. 2)}$$

where M is now reservist, not active duty, pay
C_p is the primary wage and
C_s is the secondary wage.

We hypothesize that the partial derivations of f with respect to C_p and C_s are both negative.

Data limitations force us to pare down the model represented by Equation 2. This analysis will rely upon time series data. We use observations over time to facilitate our projections of future enlistments. Cross-sectional models are incapable of examining effects which carry over from one period to another. Also, the implications of errors due to misspecifications differ in time series and cross-sectional models.

The data base consists of quarterly observations from the first quarter of 1973 through the first quarter of 1979. Because the draft effectively ended in December of 1972, this period covers the full length of the all-volunteer era. Restricting ourselves to all-volunteer data allows us to drop draft pressue (D) from our model. Appendix A provides a complete description of data sources used for this analysis. Besides listing each variable's value for each period in the analysis, the appendix also displays graphs of all accession levels.

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*Robert Shishko and Bernard Rostker, "The Economics of Multiple Job Holding," *American Economic Review*, June 1976.

The paucity of available data, however, constrains this analysis. No measures of secondary wage levels exist across time for the nation as a whole. Consequently, the equations cited in Section III omit C_s. The pay of active duty military personnel is tied by law to civilian wages. The simple correlation between these two variables is .986. The drill pay and summer camp pay of reservists is, in turn, directly related to active duty pay levels. This high correlation, known technically as multicollinearity, precludes our entering both variables in our regression equation. We have chose for this reason to omit M.

These omissions will hamper our interpretations of the remaining coefficients in the model. It is well known that the omission of variables from a regression equation biases all included coefficients. In particular the coefficient of C_p will be severely affected. The size of this bias is

$$\text{bias in } \beta(C_p) = \beta(C_s)\,\alpha(C_s,C_p) + \beta(M)\,\alpha(M,C_p) \qquad \text{(Eq. 3)}$$

where $\alpha(C_s,C_p)$ and $\alpha(M,C_p)$ are coefficients from auxiliary regressions in which C_s and M are regressed on all variables included in the model.

Because the sign of $\beta(C_s)$ is negative and the two variables C_s and C_p are positively correlated*, the first product biases our estimate of $\beta(C_p)$ downwards. Conversely the second product introduces a positive bias. There is no assurance whatsoever these two biases will be offsetting. As long as our principal goal is the forecasting of reserve accessions, we need not be too concerned with the problems which this misspecification has introduced. We should however avoid placing too much faith in the results for any particular coefficient without considering its potential bias.

---

*The Survey of Income and Earnings in 1975 did acquire cross-sectional data about the incomes of full-time and part-time workers by state. The simple correlation between these two variables was .55.

Our model therefore reduces to:

$$A = f(C_p, U, P, X) \qquad \text{(Eq. 4)}$$

In the analysis to follow, the X term will encompass three types of variables. We will add quarterly dummies to Equation 4 to capture the seasonal variations in recruiting patterns. We will add a time trend to the equation to represent the effects of any omitted variables which increase or decrease at relatively constant rates. Finally, we will add a dummy variable for all periods after 1977 to test for a shift in enlistment propensities during 1978.

III. EMPIRICAL RESULTS

This section will present the results of our regression analysis of reserve supply behavior. Although data problems do not permit a full test of an economic model explaining this behavior, we do offer substantial evidence that unemployment plays a key role in the reserve participation decisions of NPS personnel.

This section will consider results for NPS and PS accessions separately. We disaggregate accessions into these two categories because a number of factors suggest their behaviors are fundamentally different. Their characteristics are quite disparate--PS personnel are much older on average, enlist for shorter contractual terms, receive higher pay, and do not require initial training. Results in this section suggest that unemployment plays a substantially different role in their individual decisions.

This section will not, however, disaggregate total DoD accessions into individual component supplies. A DoD-wide supply of recruits is an appropriate measure of reserve supply for two reasons. First, observed reserve accessions are themselves random variables. As random variables, the number of reported accessions may vary from one period to another, even if there are no changes in the underlying determinants of reserve supply. To the extent that each component's accessions are independent of those in other components, summing accessions across all components reduces the uncertainty in the dependent variable and increases the precision of the forecasts.

Second, the model of Selected Reserve accessions which we develop below omits a critical variable--recruiting effort. If recruiting efforts were proportional across components, across states, and over time, then this omission would not affect the choice of dependent variable. However, through much of the observation period, January of 1973 through March of 1979, recruiting resources of Selected Reserve Components were quite limited. In fact, the participating reservists themselves often functioned as recruiters. Given the many other demands on reservists' time, we would expect considerable variations of recruiting efforts across components.

Analysis of Selected Reserve enlistment rates show large variations across states and negative correlations between observed rates of the six components. This suggests that components allocated their recruiting resources selectively by recruiting heavily in one region and less intensively in another or by emphasizing recruiting campaigns during one period of the year. The summation of all reserve accessions into a total accession variable may therefore provide a more accurate measure of true reserve supply potential at any single point in time because variations in recruiting efforts can be averaged across all six components.

Appendix B presents analysis of the individual component supplies of both NPS and PS accessions neglecting any competition variables. There we show that no great differences do arise if accessions are disaggregated.

The final form of the estimated equation is shown in Equation 5. Its functional form is that of the logistic function. This functional form is often used in analyses of choice between two alternatives. (Here these alternatives are to enlist or not to enlist). It has the useful property that estimates of reserve enlistment propensities are constrained between 0 and 1. This is not the case for the linear specification.* We add a trend variable to test for shifts in enlistment propensities over time.

$$\frac{\Sigma A_i}{P} = \frac{1}{1 + e^{-(a + b\,C_p + cU + dQ_1 + fQ_2 + gQ_3 + h\,T + e)}} \qquad \text{(Eq. 5)}$$

*Alternative estimation of the model using a linear probability function produced very similar results.

where A_i are accesssions to component i,
P is population,
C_p is the civilian primary wage,
U is the unemployment rate,
Q_j are quarterly dummies, and
T is a time trend.

Non-Prior Service

Table 1 displays estimates of the coefficients in Equation 5 and their associated statistics for NPS accessions. The fit is quite good. All observed signs agree with their anticipated values. Four of the six variables are significant at the customary .05 level. One of the remaining variables, the time trend, still has a t statistic above one.

Table 1

NON-PRIOR SERVICE REGRESSION RESULTS--DOD TOTALS

	Coefficient	t-Statistic	Elasticity
Primary wage	-.3120	-.65	-1.50
Unemployment rate	.0591	4.67	.81
Quarter 1 (Jan-Mar)	.3046	5.31	--
Quarter 2 (Apr-Jun)	.1960	3.24	--
Quarter 3 (Jul-Sep)	.1350	2.23	--
Time trend	.0494	1.12	--
Constant	-7.3808	-3.95	--
R^2	.87		
F(6,18)	20.30		
Durbin-Watson Statistic	1.66		

The size of the two elasticity values also shown in Table 1 are moderately troubling. These values are higher than other analysts have found for active force or reserve force accessions.* Because of the misspecification problems discussed in Section II, we do not place much credence in our estimated primary wage elasticity.

The most important result shown in Table 1 is the strong effect which unemployment exerts on NPS accession rates. The unemployment variable is highly significant with an elasticity which, although reasonable in magnitude, is higher than usually observed for active force accessions. David Grissmer** and Richard Cooper*** estimated unemployment elasticities for active force accessions of only .48 and .19, respectively. Richard Fernandez† has questioned these results and argued that inclusion of lagged unemployment effects results in a truer, and higher, unemployment elasticity. Since we have used quarterly observations, rather than the monthly observations used by Cooper and Grissmer, our equation, even though it includes only the current value of unemployment, captures more of the lagged unemployment *effect than did Cooper's* or Grissmer's model. Thus, one would expect our unemployment elasticity to be higher.

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*Two reserve accession studies are (1) Bernard Rostker, Volume III of the Air Reserve Personnel Study, *Total Force Planning, Personnel Costs and the Supply of New Reservists*, The Rand Corporation, R-1430-PR, October 1974, and (2) Robert Kelly, *The Supply of Volunteers to the Selected Reserve*, Department of Social Sciences, United States Military Academy, May 1979 (mimeo).

**David W. Grissmer, "The Supply of Enlisted Volunteers in the Post-Draft Environment: An Analysis based on Monthly Data, 1970-1975," in Richard V. L. Cooper (ed.), *Defense Manpower Policy: Presentations from the 1976 Rand Conference on Defense Manpower*, The Rand Corporation, R-2396-ARPA, December 1976.

***Richard V. L. Cooper, *Military Manpower and the All-Volunteer Force*, The Rand Corporation, R-1450-ARPA, September 1977.

†Richard L. Fernandez, *Forecasting Enlisted Supply: Projections for 1979-1990*, The Rand Corporation, N-1297-MRAL, September 1979.

We did experiment with Equation 5 by adding a variable for unemployment lagged one period. The coefficient of this variable was negative and insignificant. Because a negative lagged effect is implausible, our chosen specification omits any distributed lag structure.

The quarterly dummies show an interesting seasonal pattern to reserve recruiting. Active force recruiting shows a pronounced peak during the summer months and a much smaller secondary peak during January and February. Reserve NPS recruiting seems to peak in the first quarter and then fall off steadily throughout the rest of the year. Reserve annual two week training periods, usually held during the summer months, probably inhibit summer NPS recruiting.

Finally, the time trend suggests the reserve NPS accession rate has increased throughout the AVF period. Increased resources provided to and increased efficiency of reserve recruiting could account for this trend. Because a positive trend could arise from a variety of other sources, no definite interpretation of this trend is possible.

Before proceeding to accession projects, we should briefly consider some of the potential problems which are often associated with this type of analysis. First, we should consider the possibilities of autocorrelation in the error terms. The Durbin-Watson statistic indicates no positive serial correlation exists in the model.

Fernandez's recent study found a significant drop in the propensity to enlist in the active force during 1978.* If we add a dummy for the four quarters of 1978 and the single quarter of 1979, our results suggest that a comparable shift has occurred for NPS accessions into the selected reserve. The downward shift is equivalent to 6.1 percent of the average reserve accession level.

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*Ibid.

The bias in these pay coefficients precludes the use of this equation to forecast changes in reserve accessions which would result from changes in the ratio of reserve to civilian pay. If we assume, however, that the ratio remains constant--the assumption made in the construction of the accession projections in the AVF Report--we can still use the unemployment coefficient from the regression to assess the likely impact of changing unemployment rates on reserve accessions.

Some simple algebraic manipulation yields a form of the model more suited for use in the accessions projections. Equation 2 can be rewritten in a logistic form. In Equation 6, the dependent variable has been rewritten as a single variable L_t and we have added the time subscripts implicit in the prior formulation.

$$L_t = a + bM_t + cC_{pt} + dC_{st} + fU_t + gQ_{1t} + hQ_{2t} + jQ_{3t} + kT_t + e \qquad \text{(Eq. 6)}$$

$$\text{where } L_t = \log\left[\frac{\Sigma A_{it}/P_t}{1 - \Sigma A_{it}/P_t}\right]$$

If we revise our formulation from one including absolute pay differences to one using a pay ratio and take first differences, we get

$$\Delta L = b'\Delta(M/C_p) + c'\Delta(M/C_s) + f\Delta U + g\Delta Q_1 + h\Delta Q_2 + j\Delta Q_3 + k + e' \qquad \text{(Eq. 7)}$$

where $\Delta Z = Z_t - Z_{t-1}$ for any variable Z.

The constant term now represents the trend effect. Because M, C_p, and C_s are highly correlated, the first differences of their ratios are virtually zero. Thus, the form in Eq. 8* is nearly equivalent to our original model, less susceptible to bias, and more adaptable to projection's use.

$$\Delta L \simeq f\Delta U + g\Delta Q_1 + h\Delta Q_2 + j\Delta Q_3 + k + e' \qquad \text{(Eq. 8)}$$

The crucial coefficient in Eq. 8 is the unemployment coefficient, f, from which we derive the unemployment elasticity. Reestimation of the model in the form (8) yields an elasticity of .63, as shown in Table 2. Although this value is 22 percent less than our estimate derived from Eq. 5, neither is statistically different from the other. Both exceed the customary elasticities associated with active force

Table 2

NON-PRIOR SERVICE REGRESSION RESULTS--FIRST DIFFERENCES

	Coefficient	t-Statistic	Elasticity
Unemployment rate	.0464	1.73	.63
Quarter 1 (Jan-Mar)	.2980	6.80	--
Quarter 2 (Apr-Jun)	.1924	3.77	--
Quarter 3 (Jul-Sep)	.1345	2.97	--
Constant	.0210	0.82	--
R^2	.74		
F(4,19)	13.62		
Durbin-Watson Statistic	2.18		

*We have used the minimum logit chi-square methodology throughout this note. The weights to estimate Eq. 8 are not $n_t P_t(1-P_t) = T_t$ as is customary, but rather $T_t + T_{t-1}$.

analyses. It is the new value of .63 which we will employ in the projections of Section IV. Choice of the lower value affords us a conservative position in assessing the impacts of unemployment fluctuations on reserve recruiting.

Prior Service

Table 3 shows estimates of the coefficients in Eq. 5 for PS accessions to the reserve forces. As was true for the NPS results, all observed signs agree with their expected values. Although the overall fit of the equation is good, significance levels of all coefficients drop sharply, probably because of the reduced number of degrees of freedom. The elasticity for primary wages is quite high and probably adversely affected by the specification bias in the equation.

The unemployment elasticity is .47 and is insignificant. This reduction from the NPS elasticity value indicates PS accessions are

Table 3

PRIOR SERVICE REGRESSION RESULTS--DOD TOTALS

	Coefficient	t-Statistic	Elasticity
Primary wage	-.8493	-2.18	-4.37
Unemployment rate	.0935	1.35	0.47
Quarter 1 (Jan-Mar)	.0498	1.04	--
Quarter 2 (Apr-Jun)	-.0251	-0.52	--
Quarter 3 (Jul-Sep)	.1215	2.66	--
Time trend	.0747	1.86	--
Constant	-2.8693	-2.01	--
R^2	.87		
F(6,10)	10.88		
Durbin-Watson Statistic	1.89		

less sensitive to macroeconomic fluctuations than NPS accessions. Since PS personnel have greater labor market experience and larger stocks of human capital, this result makes sense. As was the case for the NPS equation, the addition of a lagged unemployment effect produces a negative, insignificant coefficient.

The quarterly dummies indicate the recruiting cycle for PS personnel differs from that for NPS personnel. In fact, the PS recruiting cycle looks remarkably similar to the pattern for active duty accessions. The relative size of the time trend is much larger for PS than NPS personnel. During the AVF period, the reserves have turned increasingly to PS personnel to fill personnel shortages.

If we reestimate the PS equation in the first difference form of Eq. 8, we obtain an unemployment elasticity of .22. As we will do for the NPS projections, we will also use this lower, conservative unemployment elasticity for the PS projections discussed in the next section.

IV. PROJECTIONS OF FUTURE RESERVE ACCESSIONS

We are now ready to project future accessions into the selected reserve components. The projection methodology is essentially quite simple. We will first calculate an enlistment rate during a base period. We will next use the unemployment elasticities estimated previously to modify the enlistment rate during future years according to projections of future national economic growth rates. Finally, we will apply these enlistment rate projections to projections of the size of the pool of 17 to 24 year old males.

The basic equation for projecting accessions is derivable directly from the definition of an unemployment elasticity.

$$\eta \equiv \frac{\Delta\left(\frac{A_i}{P}\right)}{\frac{A_i}{P}} \cdot \frac{U}{\Delta U} \qquad \text{(Eq. 9)}$$

Therefore

$$A_{it} = A_{io} \frac{P_t}{P_o} \left[1 + \eta \frac{\Delta U}{U_o}\right] \qquad \text{(Eq. 10)}$$

where subscript o indicates base period and t the projection period.

Projecting Non-Prior Service Accessions

We have chosen the actual NPS enlistments during calendar year 1978 as the base enlistment level A_o to start our projections. We use actual values instead of estimated ones because we are not employing the entire regression equation in the projection methodology. The choice between 1978 and an average level over the entire AVF period is of small consequence for the two Guard components. The difference between the rates for 1978 and for the entire period is only 3.5 percent and -2.9 percent for the Army and Air Guard, respectively. However, the choice does matter for the other four

reserve components. Later years should be more representative of how reserve components will recruit in the future. Many reserve components adjusted only slowly to the new recruiting environment which accompanied the All-Volunteer Force.

For future economic scenarios, we use the unemployment projections constructed by Fernandez.* These projections are shown in Table 4 and allow us to introduce uncertainty into our projections by recognizing the possibility of low, moderate, and high growth paths for the U.S. economy over the next ten years. The NPS projections utilize the youth unemployment rates while the PS projections utilize the general rate.

Table 4

UNEMPLOYMENT SCENARIOS

Calendar Year	Moderate Growth		Low Growth		High Growth	
	General	Youth	General	Youth	General	Youth
1979	6.2	16.3	6.2	16.3	6.2	16.3
1980	6.8	17.3	6.8	17.3	6.8	17.3
1981	6.6	17.0	6.8	17.3	6.3	16.5
1982	6.2	16.3	6.9	17.5	5.1	14.4
1983	5.9	15.8	6.9	17.5	4.1	12.7
1984	5.5	15.1	6.9	17.5	4.0	12.5
1985	5.5	15.1	6.9	17.5	4.0	12.5
1986	5.5	15.1	6.9	17.5	4.0	12.5
1987	5.5	15.1	6.9	17.5	4.0	12.5
1988	5.5	15.1	6.9	17.5	4.0	12.5
1989	5.5	15.1	6.9	17.5	4.0	12.5
1990	5.5	15.1	6.9	17.5	4.0	12.5

*Fernandez derived these unemployment projections from CBO data cited in "Five Year Budget Projections and Alternative Budgetary Strategies for Fiscal Years 1980-1984, A Report to the Senate and House Committees on the Budget--Part II," Congress of the United States, Congressional Budget Office, U.S. Government Printing Office, Washington, D.C., January 1979.

Figure 1 displays the Army Guard projections. The NPS projections for all other components show identical trends. The numerical values of the projections for all components can be found in Tables C-1 through C-6 in Appendix C.

These projections indicate that the level of NPS accessions will peak in 1980 and then steadily decline throughout the 1980s. By 1990, it will be only 81 percent of its 1979 level. Our economic scenario assumptions have almost no effect until 1984. During the late 1980s, our low growth scenario averages about 10 percent more accessions than occur under the moderate growth scenario. Similarly, the high growth scenario averages about 10 percent fewer accessions.

Projecting PS Accessions

We use a procedure analogous to that of the NPS projections for the PS projections. The base year will again be 1978. The unemployment projections are those contained in Table 4 under the "General" unemployment headings. The pool of potential enlistees is the total Vietnam-era population. As noted in Appendix A, we are assuming constant rates of decline in the pool of potential PS enlistees. Although the veteran population itself will increase in size, our assumption recognizes that veterans who have rejected reserve enlistment for a number of years are unlikely candidates for future enlistment. Given the ad hoc nature of this pool projection, we have chosen to curtail our PS projections at 1985.

The results of this projection procedure for the Army Guard case are shown in Figure 2. Appendix C contains the projection results for the other reserve components. Once again, the general trend of PS projections is the same across all components because the principal determinant of their size is the pool of eligible veterans.

The PS projections also show the initial increase then steady decrease found in the NPS projections. Accession levels peak in 1980 then decline until 1985 accessions are only 89 percent of the 1979 level. Our economic scenario assumptions do not significantly

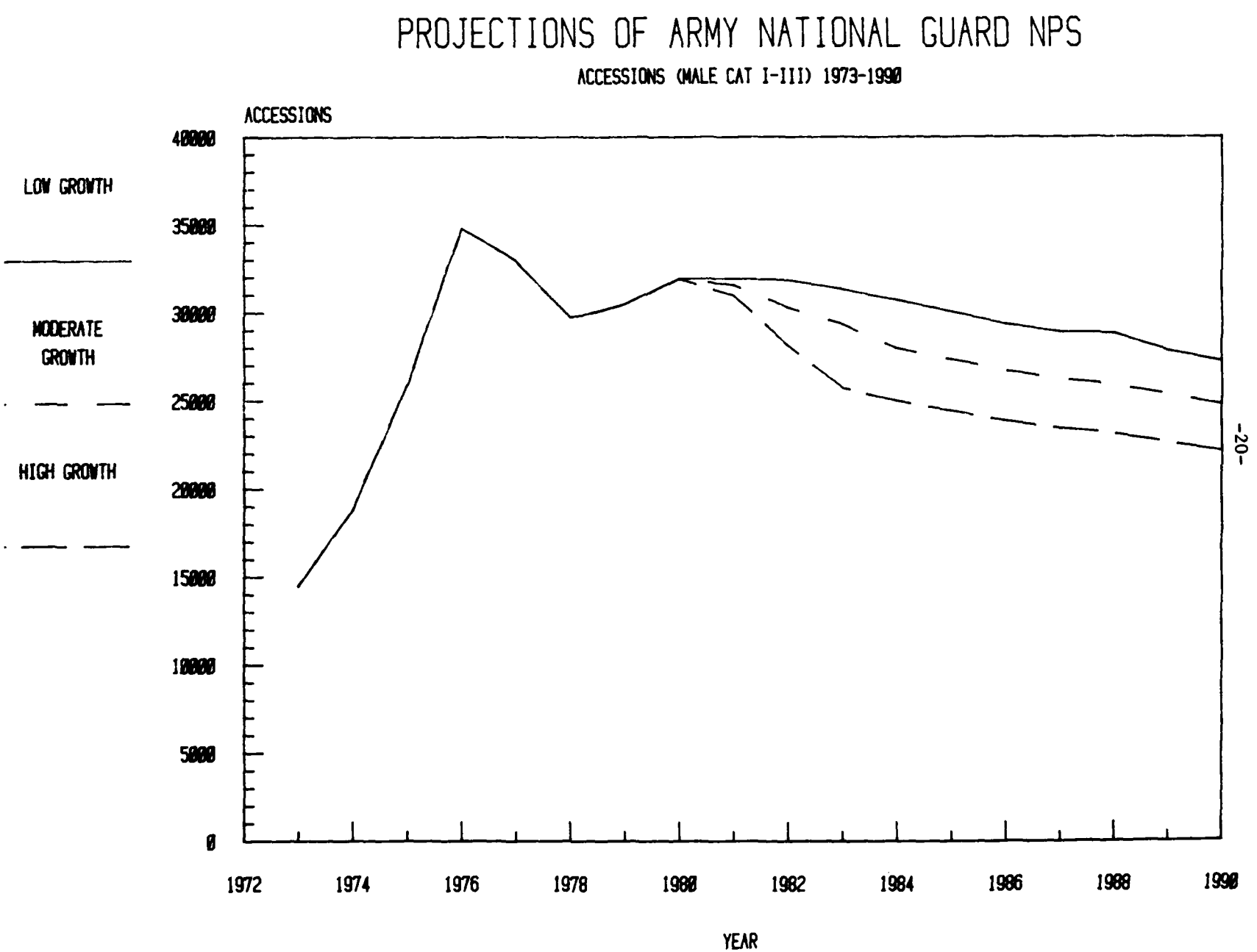
PROJECTIONS OF ARMY NATIONAL GUARD NPS
ACCESSIONS (MALE CAT I-III) 1973-1990
ACCESSIONS
40000
35000
30000
25000
20000
15000
10000
5000
0
LOW GROWTH
MODERATE GROWTH
HIGH GROWTH
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
YEAR

Figure 1

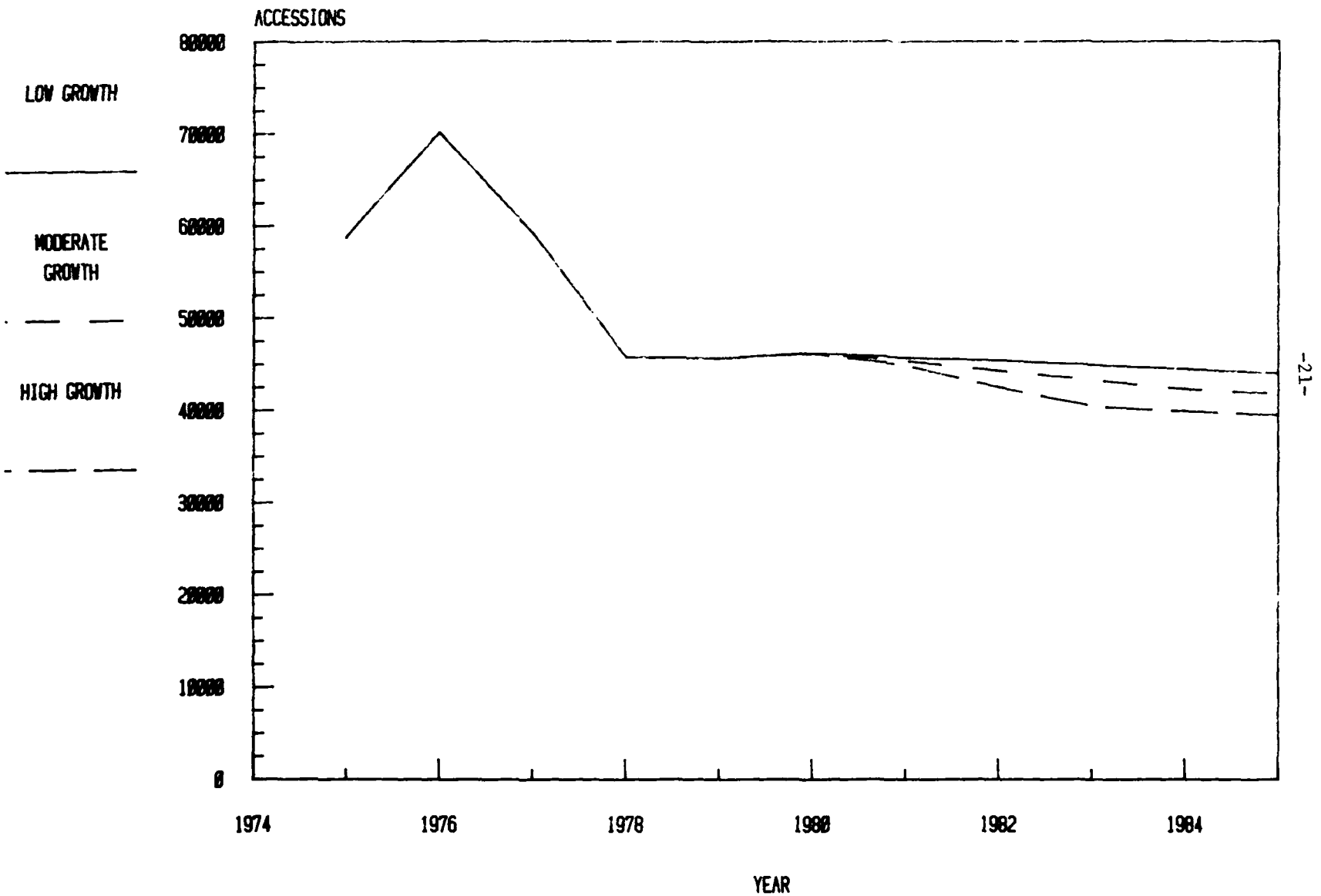
PROJECTIONS OF ARMY NATIONAL GUARD PS
TOTAL ACCESSIONS, 1975-1985
ACCESSIONS
80000
70000
60000
50000
40000
30000
20000
10000
0
LOW GROWTH
MODERATE GROWTH
HIGH GROWTH
1974
1976
1978
1980
1982
1984
YEAR

Figure 2

impact the projections until 1982. During the mid-1980s, these scenarios do cause a 5 percent deviation from the levels predicted under the moderate growth scenario.

V. CONCLUDING REMARKS

Just as we divided our analysis into two distinct parts--supply analysis and projections--so too will we divide our concluding remarks. First, we will discuss the implications of this new set of projections for future selected reserve force planning. Secondly, we will summarize the major findings of the supply analysis of Section III.

Implications for Strengths of the Selected Reserve Components

The fundamental purpose of reserve manpower planning is the preparation of the Selected Reserve Units for use in any major war. While we cannot possibly complete the many additional tasks required to answer this question in a paper of this limited scope, we can use these accession forecasts to make some comments about the relative health of the Selected Reserve Components over the next five years.

First of all, we must obtain projections of total accessions into each component. For the PS accessions, these projections are presented in Tables C-7 through C-12. In the NPS case, our projections were for male Category I through III enlistees only. Although each component could easily alter its total NPS accessions by adjusting enlistment standards, we can reasonably assume that current standards will remain unchanged over the next six years. This assumption enables us to convert the projections presented in Tables C-1 to C-6 to total accessions simply by dividing by the percentage of accessions in each component which were male Category I through III in 1978. Table 5 shows these estimates of total accessions for the years 1979 through 1985.

When we compare (in Table 6) these estimates with projections made earlier in this study, we notice some important changes. In 1979, the percentage changes in the NPS projections range from -10.1 percent to +41.0 percent. The large increase in the Army Reserve projections results from a dramatic increase in NPS accessions in this component

Table 5

TOTAL ACCESSION PROJECTIONS

	Non-Prior Service					
	ARNG	USAR	USNR	USMCR	ANG	USAFR
1979	39341	14082	2675	8201	3751	2560
1980	41188	14744	2800	8586	3927	2682
1981	40721	14577	2768	8489	3883	2651
1982	39057	13980	2656	8142	3724	2541
1983	37840	13544	2572	7888	3608	2464
1984	36058	12907	2452	7516	3439	2346
1985	35264	12622	2397	7352	3363	2295
	Prior Service					
	ARNG	USAR	USNR	USMCR	ANG	USAFR
1979	45637	36882	15887	5249	12009	9061
1980	46163	37307	16152	5310	12046	9147
1981	45368	36665	15957	5218	11737	8841
1982	44254	35765	15647	5090	11348	8731
1983	43315	35006	15398	4982	11007	8527
1984	42231	34130	15094	4858	10631	8295
1985	41782	33767	15016	4806	10416	8188

Table 6

COMPARISONS BETWEEN SELECTED RESERVE ACCESSION PROJECTIONS

	Non-Prior Service		Prior Service	
	Difference 1979	Difference 1985	Difference 1979	Difference 1985
ARNG	-10.1%	-11.8%	-23.0%	-24.9%
USAR	+41.0%	+33.4%	- 7.6%	- 9.8%
USNR	(a)	(a)	-31.3%	-33.2%
USMCR	- 1.9%	- 1.0%	-20.3%	-22.2%
ANG	- 4.3%	- 6.8%	+ 6.5%	+ 3.6%
USAFR	- 7.0%	-12.9%	- 6.2%	- 8.7%

[a]USNR NPS accession projections are not compared here because no projection was made in our earlier work.

during 1978. In the other components, the differences between the NPS accession projections for 1979 lie well within the margin for error in such forecasts.

Three components evidence sharp decreases in their PS projection levels for both 1979 and 1985. All three decreases are the result of large declines in PS accessions in 1978 relative to the base year used in our prior work, FY77. In other words, the choice of the base year for PS projections is crucial. It is possible that this dropoff in PS accessions is directly attributable to a decline in the number of veterans who are likely to enlist in the Selected Reserves. Our crude estimates of the pool of potential PS enlistees could well be seriously in error. Improvements in PS projections will require additional analysis of the types of active force veterans who do enlist in the reserves and how long they delay their enlistment after their separation from active service.

The Reserve Supply Function

While projections provide useful information to defense decisionmakers about the magnitude of their future reserve supply problems, this type of analysis can provide even more valuable information by assessing the likely impacts of various reserve recruiting initiatives. Unfortunately, our conclusions are still too tentative to permit such assessments.

The projections of Section IV assumed no actions by the DoD to shift reserve enlistment propensities. In fact, reserve planners have already instituted a broad range of incentives for new accessions which may significantly increase future accession levels above those projected here. The bulk of these incentives involve cash bonuses and tuition assistance programs. Implicitly, these incentives are similar to pay increases for all accessions eligible to receive them. A rough indication of the effect of these incentives can be obtained by comparing actual experience with the projections of Table 5.

Table 7 shows that the projections for DoD totals underestimated actual accessions. For prior service accessions, at the aggregate DoD level, the projections were quite accurate (less than 2% even in 1979 and 1980). For NPS enlistments, the underestimates were larger, particularly for 1980.

However, this DoD wide comparison masks some major differences in accuracy among components. For the Naval and Marine Corps Reserve, the projections for both PS and NPS were in substantial error. Actual Naval Reserve accessions exceeded projections while the reverse was true for Marine Corps Reserve accessions.

This unexpected increase in reserve accession levels could be attributed to the success of recent DoD programs for reserve recruiting. A definitive answer on this point could be obtained by extending the regression analysis of Section III to include data for the 1979 and 1980 accession experience. If the model were also extended to include variables measuring the presence of the new DoD programs, an exact statistical test of these program's effectiveness would result.

Table 7

COMPARISON OF PROJECTIONS AND ACTUAL PERFORMANCE FOR 1979 AND 1980

	Non Prior-Service Enlistments					
	1979			1980		
	Projection	Actual	Percentage Difference	Projection	Actual	Percentage Difference
ARNG	39341	42580	+7.6	41188	50314	+18.1
USAR	14082	21389	+34.1	14744	25939	+43.3
USNR	2675	3117	+14.2	2800	3327	+1 .
USMCR	8201	4987	-64.4	8586	5036	-70.
ANG	3751	1319	-184.4	3927	6471	+39.
USAFR	2560	2220	-15.3	2682	2596	-3.3
Total	70610	75612	+6.6	73927	93683	+21.1

Table 7 (Cont'd)

Prior Service Enlistment

	1979			1980		
	Projection	Actual	Percentage Difference	Projection	Actual	Percentage Difference
ARNG	45637	42270	-8.0	46163	46772	+1.3
USAR	36882	33190	-11.1	37307	33509	-11.3
USNR	15887	25929	-38.7	16152	24785	+34.8
USMCR	5249	4611	-13.8	5310	4288	-23.8
ANG	12009	11204	-7.2	12046	9536	-26.3
USAFR	9061	8977	-1.0	9147	9483	+3.
Total	124725	126181	+1.2	126125	128373	+1.8

Appendix A
DATA SOURCES USED FOR THIS ANALYSIS

It goes without saying that accurate projections require accurate data. Unfortunately, much of the data used in our analysis is unaudited and therefore of unknown reliability. When we initiated this project, we expected the quality of reserve accessions data to be our major analytical problem. The extent of the problems which result from inaccurate data, especially data about reserve accessions, is very difficult to determine. Appendix B offers some evidence that reserve data quality is probably superior to our expectations. The small quantity of reserve data, especially from the early years of the all-volunteer era, is a real constraint to time series analysis of reserve behavior.

Reserve Accessions Data

The reporting systems within the DoD for reserve accessions have been in a state of flux since the arrival of the all-volunteer era. The original reporting system was a manual report, the 1108. The haphazard checks applied by personnel assembling these data necessitated frequent revisions to the submitted accession figures. To make matters worse, the format of the 1108 report changed repeatedly, making the construction of any consistent time series data stream nearly impossible.

The DoD instituted the Reserve Components Common Personnel Data System (RCCPDS) to rationalize this reporting system which most personnel managers perceived to be ineffective. The RCCPDS became the official DoD source for reserve accessions figures on July 1, 1976. Although it too has experienced its problems, its coverage and accuracy have improved rapidly during its brief life.

We have used both DoD reporting systems in assembling the data for this Rand note. We use the 1108 figures prior to July 1, 1976, and the RCCPDS figures for all later dates. The 1108 and RCCPDS systems coexisted for a few quarters prior to the demise of the 1108 report. In most components the RCCPDS and the 1108 were synchronized so that each

was reporting identical gain figures prior to the switch from one system to the other. The synchronization was never complete for the Navy and Air Force Reserves and this may introduce spurious errors in our analysis of these components.

The NPS data represent male accessions only. The period covered by the NPS analysis is the first quarter of 1973 to the first quarter of 1979--the full range of the All-Volunteer era. In the individual analysis of the Air Force Reserve (Appendix B), we have omitted the four observations for FY77 from our sample because the published RCCPDS figures for these quarters are incorrect. The total DoD analysis presented in Section III allocates these reporting errors proportionally across all quarters.

We have also corrected the NPS accession figures cited in RCCPDS/1108 for quality changes over time. The percentage of Category IV personnel entering the selected reserves has decreased from 24.5 in 1973 to 11.4 in 1978.* The NPS supply variable multiplies total gains by an estimate of the percentage of these gains falling in the upper three mental categories. The mental category percentage must be estimated because during some quarters the 1108 report aggregated mental category distributions for both males and females.

For the PS analysis, the period is shorter--varying between 17 and 19 quarters, but always ending with the first quarter of 1979. We are limited to total PS accessions because the 1108 system did not report females for the full observation period. Appendix B analyzes only four of the six components because published data for the Air Force Reserve (FY77) and the Army Reserve (FY76) are incorrect. Here again total DoD analysis proceeds by allocating reporting errors proportionally across all quarters. The limited PS sample does not permit us to merely drop these bad quarters as in the NPS analysis. Therefore, the individual PS analysis presented in Appendix B does not include these two components.

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*However, it is likely that the percentage of NPS Category IV nlistees was smaller still in 1970.

Population Figures

The population figures used within the NPS model refer to the number of 17 to 24 year old males in the United States for the given quarter. We derive these estimates from projections published by the Census Bureau.* We have interpolated annual figures to quarterly values. The projections of reserve enlistments use these same population figures to project the size of the 17-24 year old pool.

The population figures used in the PS model refer to the total number of Vietnam-era veterans in the United States. Once again, we have interpolated quarterly figures from annual data, in this case *The Statistical Abstract of the United States*.**

Early in our analysis, we used two distributed lag formulations to estimate an effective veteran pool. These two approaches projected a shrinking pool of potential PS enlistees during the 1980s. A simple linear trend extrapolation of past Vietnam veteran population figures would imply an increasing PS pool. Certainly much additional work is needed to define the size of this pool more precisely. Given the time constraints under which this study was completed, we have decided to continue with the assumptions adopted in our earlier work. We therefore assume that the veteran pool will shrink at a constant annual rate of 1 percent in the Army Guard, Army Reserve, and Marine Reserve. In the Navy Reserve, the assumed rate of decrease will be 0.5 percent. The rates will be 1.8 and 1.2 percent in the Air Guard and Air Reserve respectively. Table A-1 lists these population variables.

Economic Data

Both the unemployment data and the wage data were taken from the monthly reports of the Bureau of Labor Statistics. The wage data

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*Bureau of the Census, *Current Population Survey*, Series P-25, Number 704, "Projections of the Population of the United States, 1977-2050," July 1977.

**_The Statistical Abstract of the United States_, 1978, page 385.

***_Employment and Earnings_, monthly from January 1973 to June 1979. See Tables C-1 and A-8.

are for all private nonsupervisory employees. The unemployment data used in the NPS regressions refers to 16 to 24 year old males. In the PS regressions, the unemployment rates refer to all persons 25 years of age and older in the labor force. All three economic data series are seasonally adjusted. Table A-1 also lists these economic variables.

Figures A-1 to A-12 show the series of NPS and PS accession figures used here. In a few cases, large changes in accession values do occur. Because we do not know whether these changes are spurious, or the result of some large shift in recruiting effort or climate, we have included all observations in our sample.

Table A-1

LISTING OF PRINCIPAL INDEPENDENT VARIABLES

	Primary Wage	Military Pay	Unemployment (16-24 Yr Male)	Unemployment (Total)	Population (17-24 Yr Male)	Vietnam Veterans
73-1	3.81	307.20	10.7	*	13942	6339
73-2	3.88	307.20	10.9	*	14027	6484
73-3	3.95	307.20	10.5	*	14124	6623
73-4	4.02	326.10	10.2	*	14231	6756
74-1	4.08	326.10	11.2	*	14338	6689
74-2	4.17	326.10	11.4	*	14445	7022
74-3	4.27	326.10	12.4	3.57	14552	7152
74-4	4.36	344.10	13.7	4.40	14658	7279
75-1	4.43	344.10	16.7	5.80	14763	7406
75-2	4.49	344.10	17.8	6.40	14869	7533
75-3	4.57	344.10	17.7	6.10	14962	7656
75-4	4.66	361.20	16.9	5.93	15042	7774
76-1	4.74	361.20	15.9	5.40	15121	7893
76-2	4.82	361.20	15.4	5.30	152.01	8011
76-3	4.90	361.20	15.3	5.63	15405	8120
76-4	4.99	374.40	16.1	5.47	15734	8222
77-1	5.10	374.40	14.9	5.23	16062	8322
77-2	5.20	374.40	14.1	5.00	16391	8424
77-3	5.29	374.40	14.1	4.80	16581	8424
77-4	5.39	397.50	13.0	4.63	16633	8626
78-1	5.50	397.50	13.3	4.10	16686	8726
78-2	5.63	397.50	11.8	4.03	16738	8828
78-3	5.74	397.50	12.0	4.07	16779	8928
78-4	5.87	419.40	12.4	3.87	16809	9030
79-1	6.02	419.40	12.3	4.27	16840	9130

*Not used in the analysis.

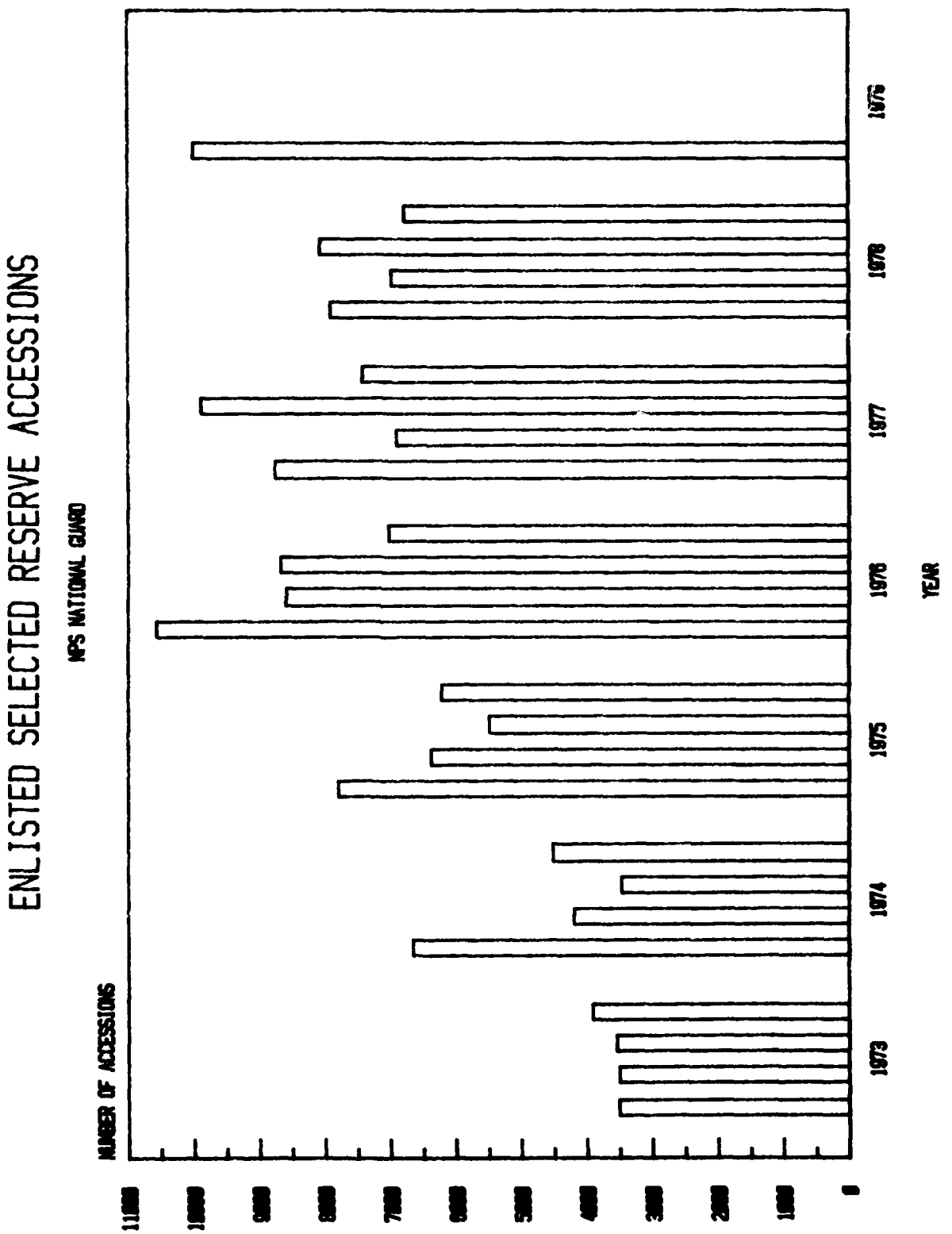
ENLISTED SELECTED RESERVE ACCESSIONS
NPS NATIONAL GUARD
NUMBER OF ACCESSIONS
YEAR
1973
1974
1975
1976
1977
1978
1979

Figure A-1

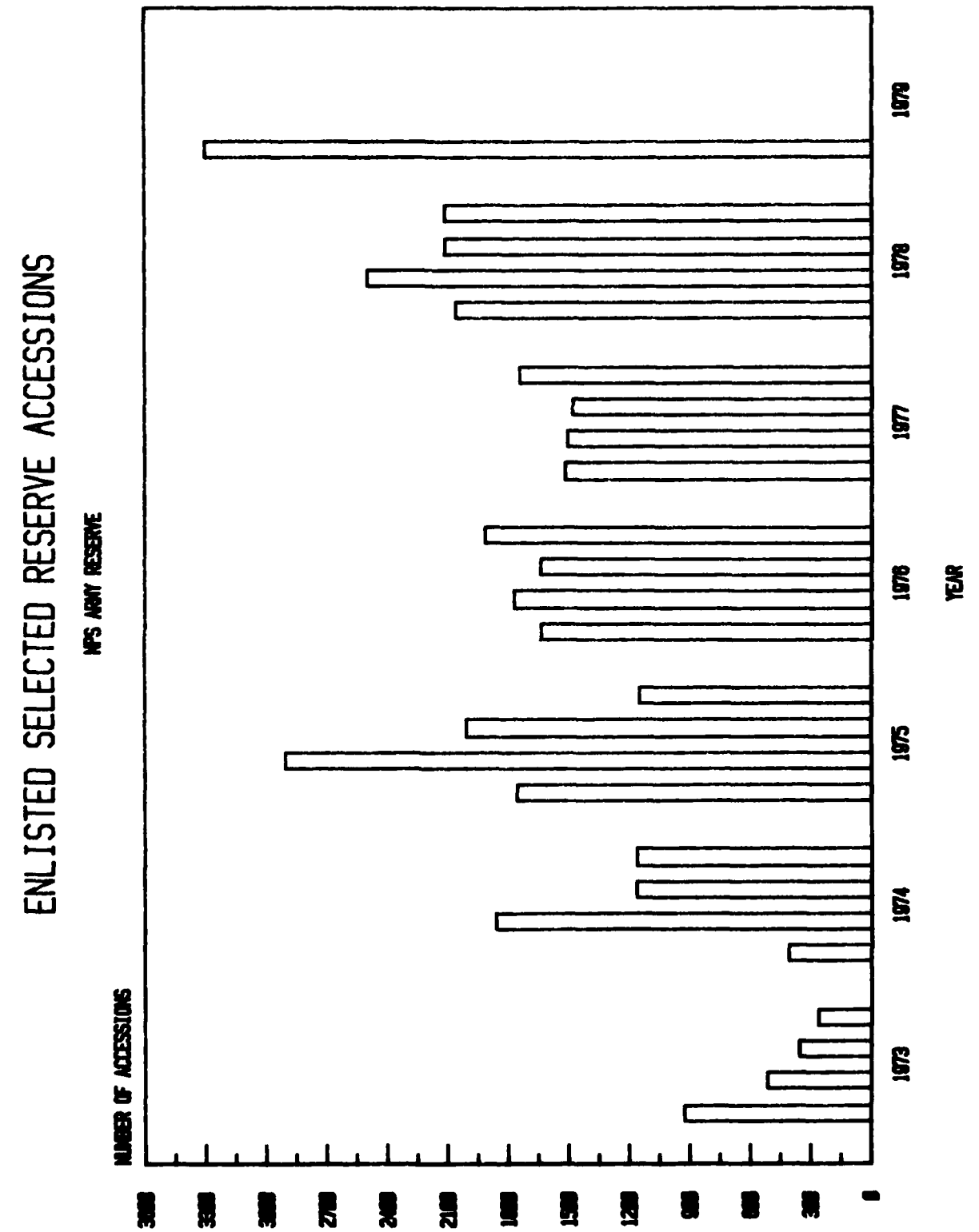
ENLISTED SELECTED RESERVE ACCESSIONS
NPS ARMY RESERVE
NUMBER OF ACCESSIONS
YEAR
1973
1974
1975
1976
1977
1978
1979

Figure A-2

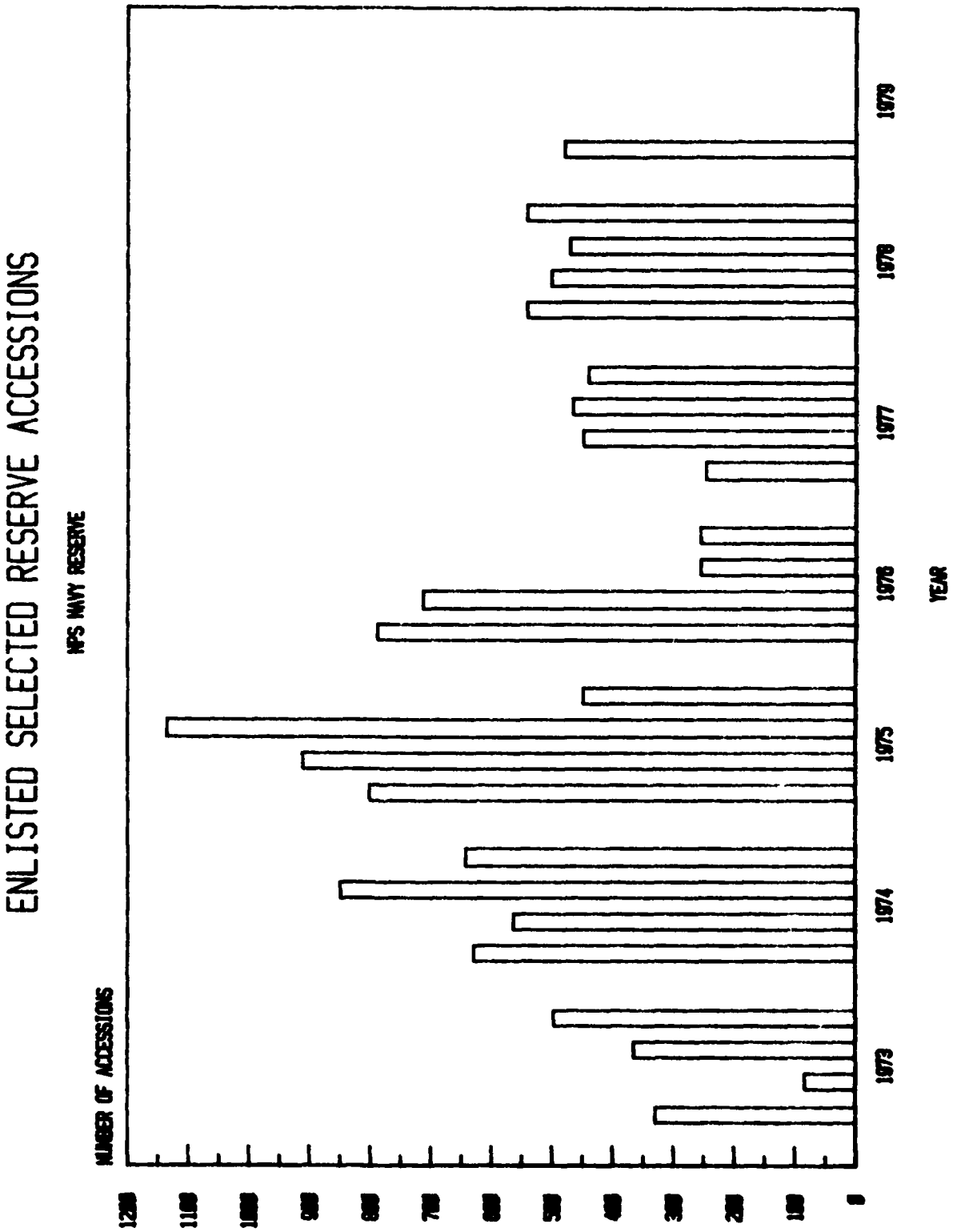
ENLISTED SELECTED RESERVE ACCESSIONS
NPS NAVY RESERVE
NUMBER OF ACCESSIONS
YEAR
1973
1974
1975
1976
1977
1978
1979

Figure A-3

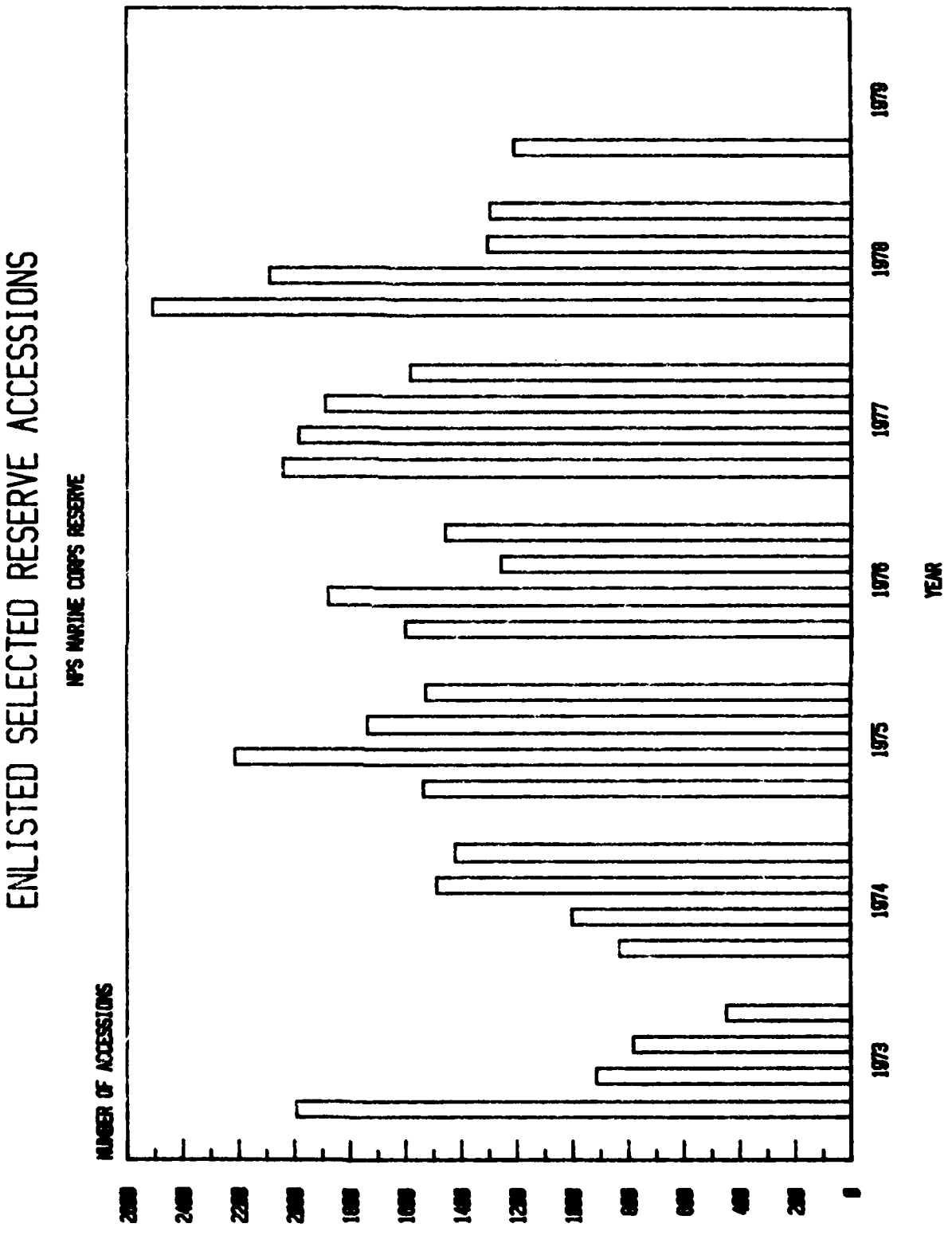
ENLISTED SELECTED RESERVE ACCESSIONS
NPS MARINE CORPS RESERVE
NUMBER OF ACCESSIONS
2000
1800
1600
1400
1200
1000
800
600
400
200
0
1973
1974
1975
1976
1977
1978
1979
YEAR

Figure A-4

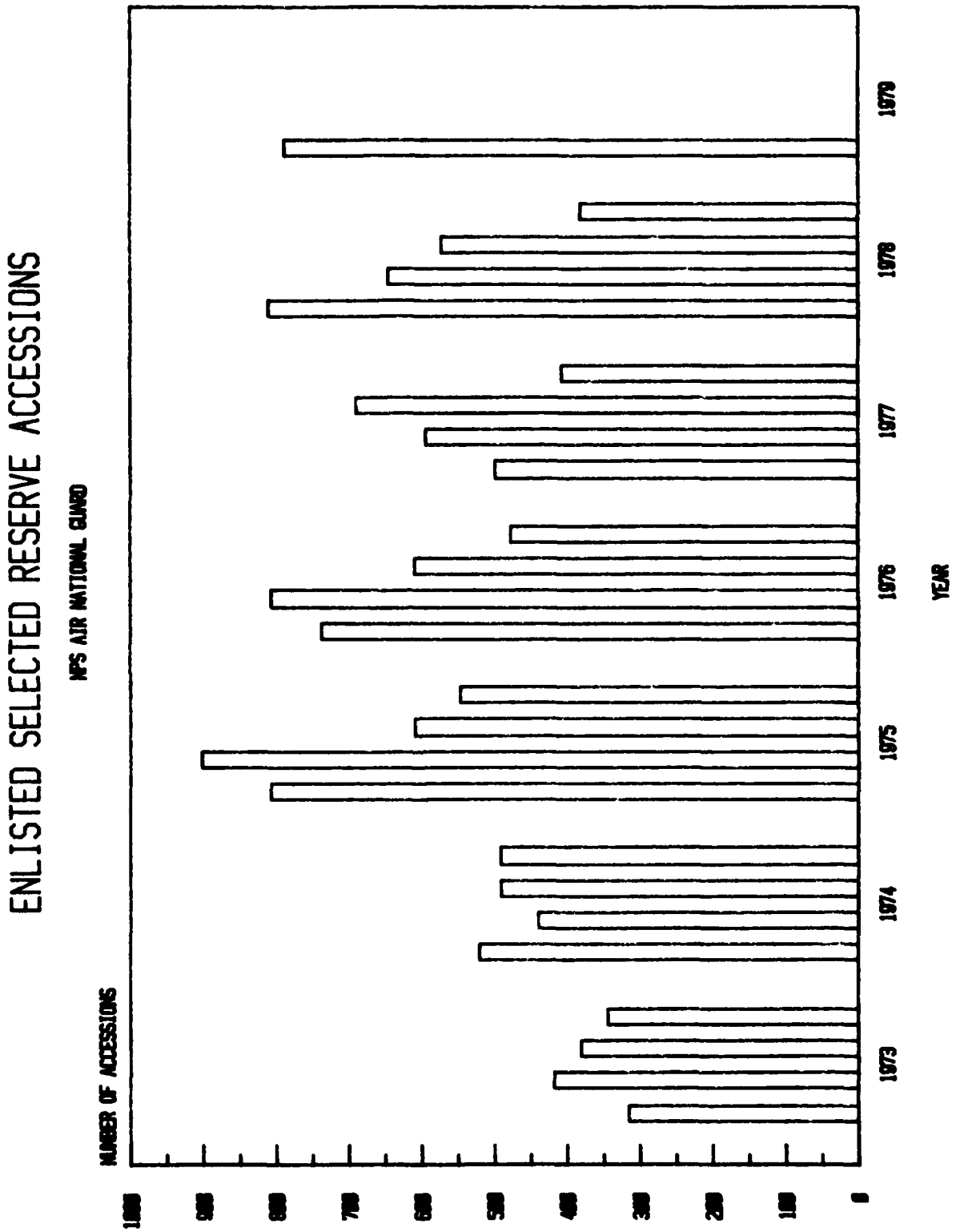
ENLISTED SELECTED RESERVE ACCESSIONS
NPS AIR NATIONAL GUARD
NUMBER OF ACCESSIONS
1000
900
800
700
600
500
400
300
200
100
0
1973
1974
1975
1976
1977
1978
1979
YEAR

Figure A-5

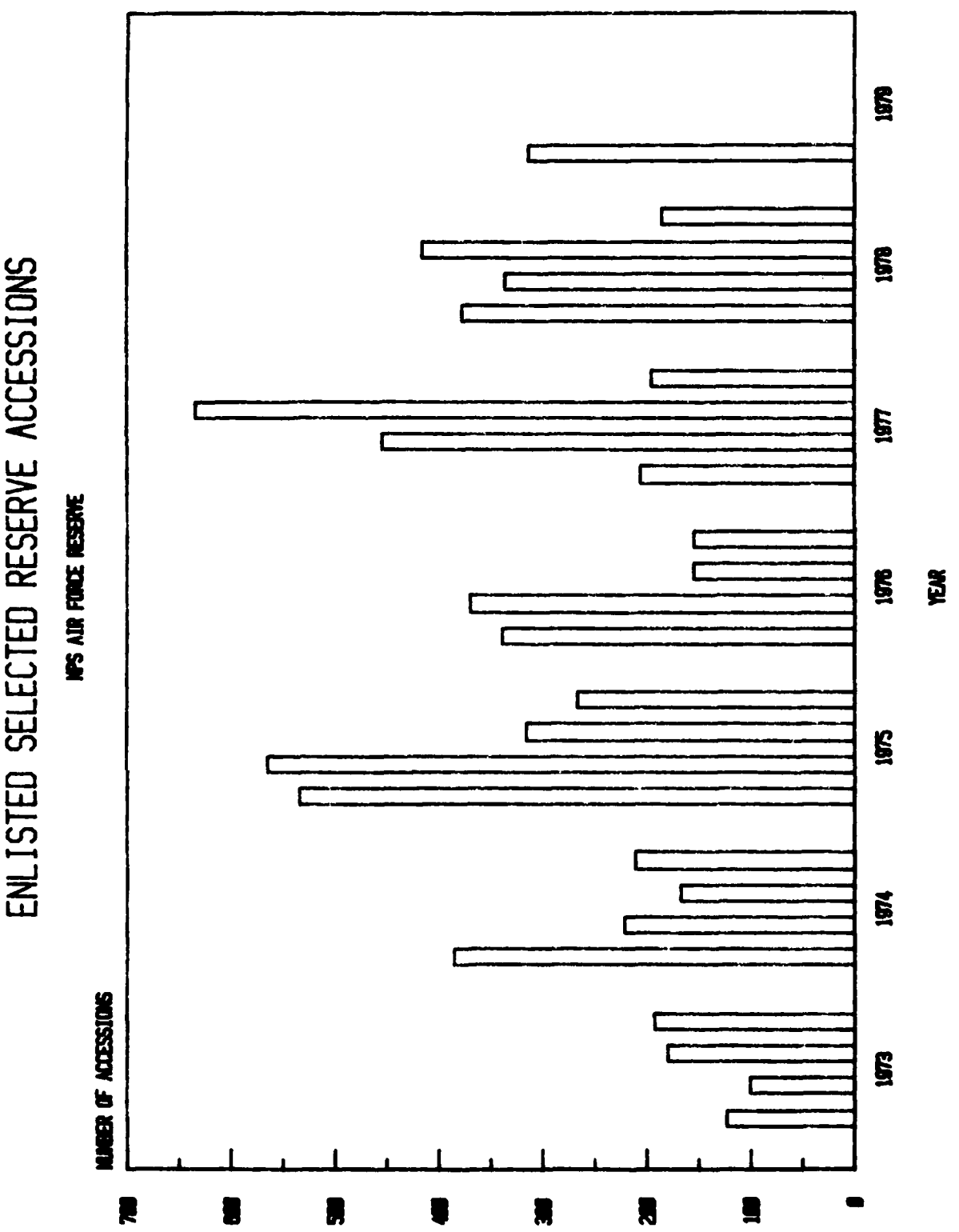
ENLISTED SELECTED RESERVE ACCESSIONS
NPS AIR FORCE RESERVE
NUMBER OF ACCESSIONS
700
600
500
400
300
200
100
0
1973
1974
1975
1976
1977
1978
1979
YEAR

Figure A-6

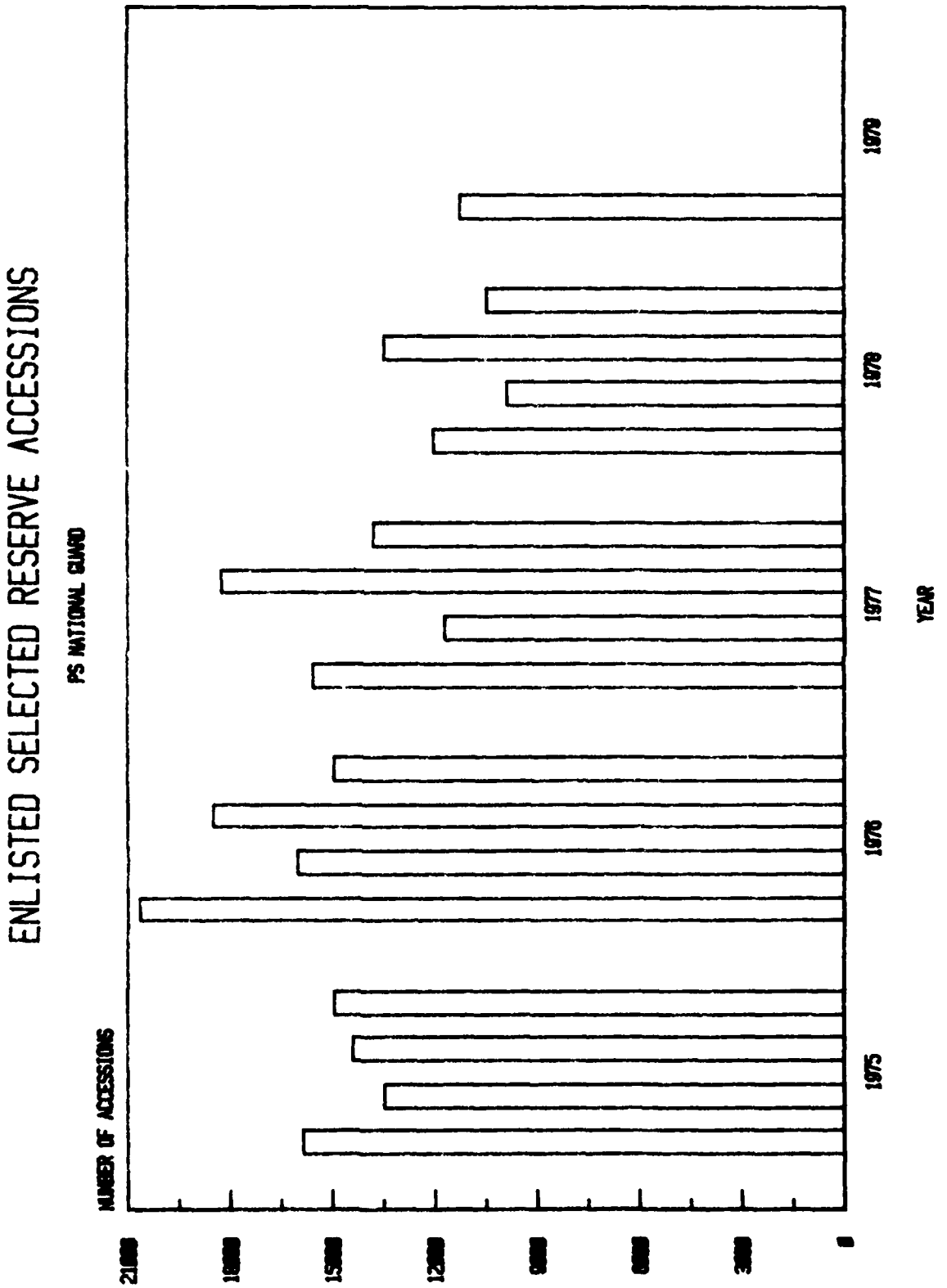
ENLISTED SELECTED RESERVE ACCESSIONS
FY NATIONAL GUARD
NUMBER OF ACCESSIONS
YEAR
1975
1976
1977
1978
1979

Figure A-7

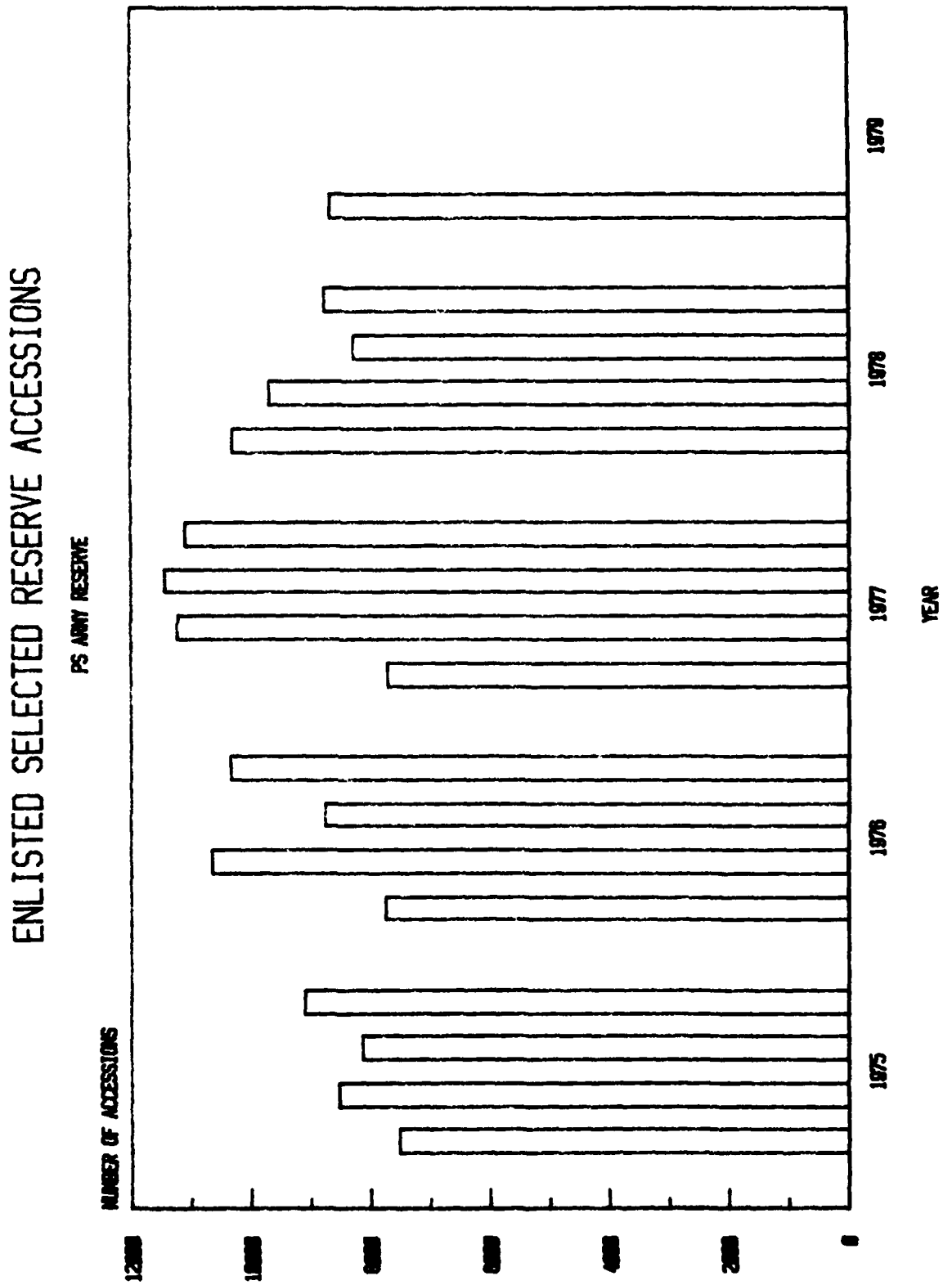
ENLISTED SELECTED RESERVE ACCESSIONS
PS ARMY RESERVE
NUMBER OF ACCESSIONS
YEAR
1975
1976
1977
1978
1979

Figure A-8

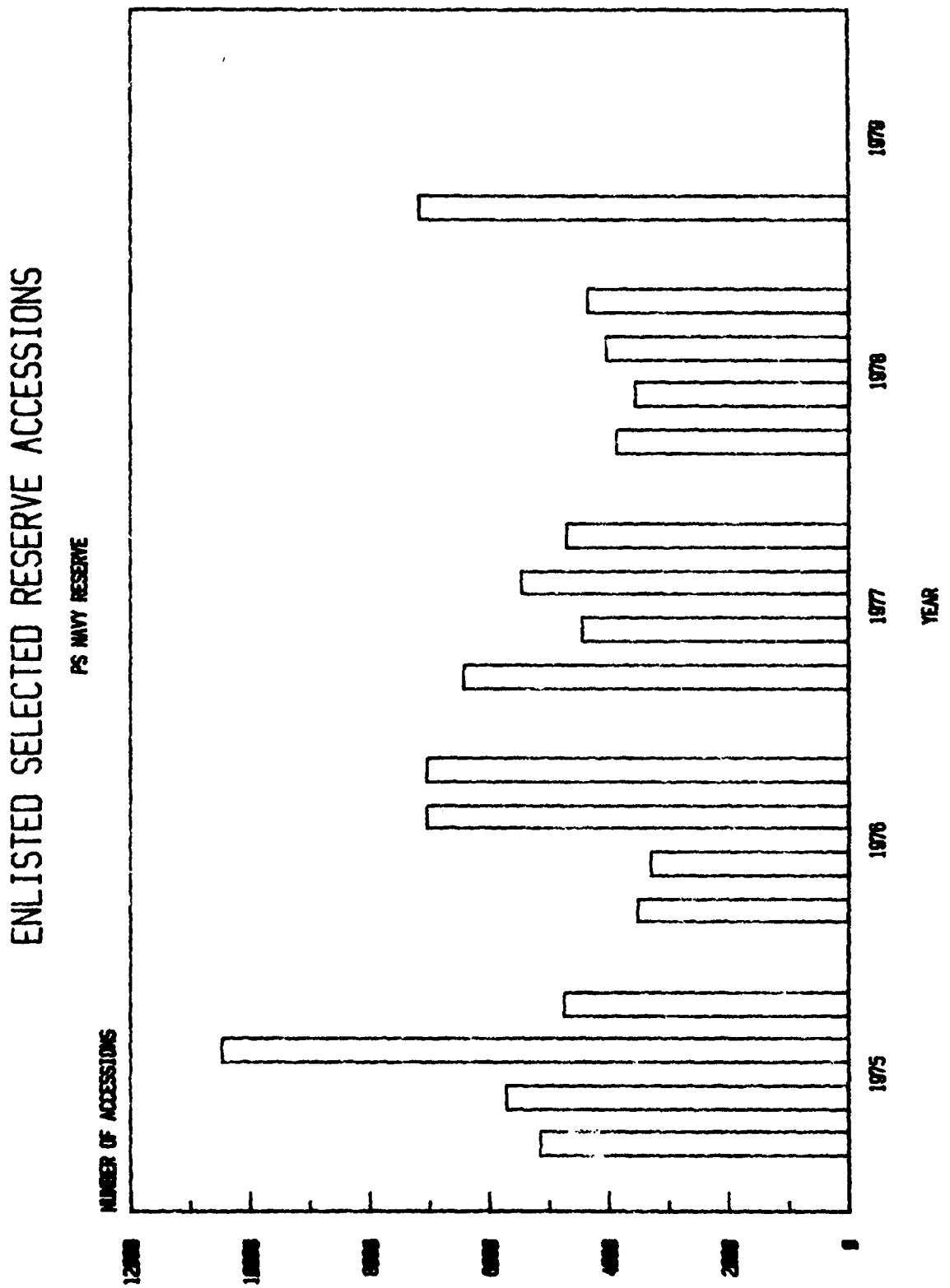
ENLISTED SELECTED RESERVE ACCESSIONS
PS NAVY RESERVE
NUMBER OF ACCESSIONS
1200
1000
800
600
400
200
0
1975
1976
1977
1978
1979
YEAR

Figure A-9

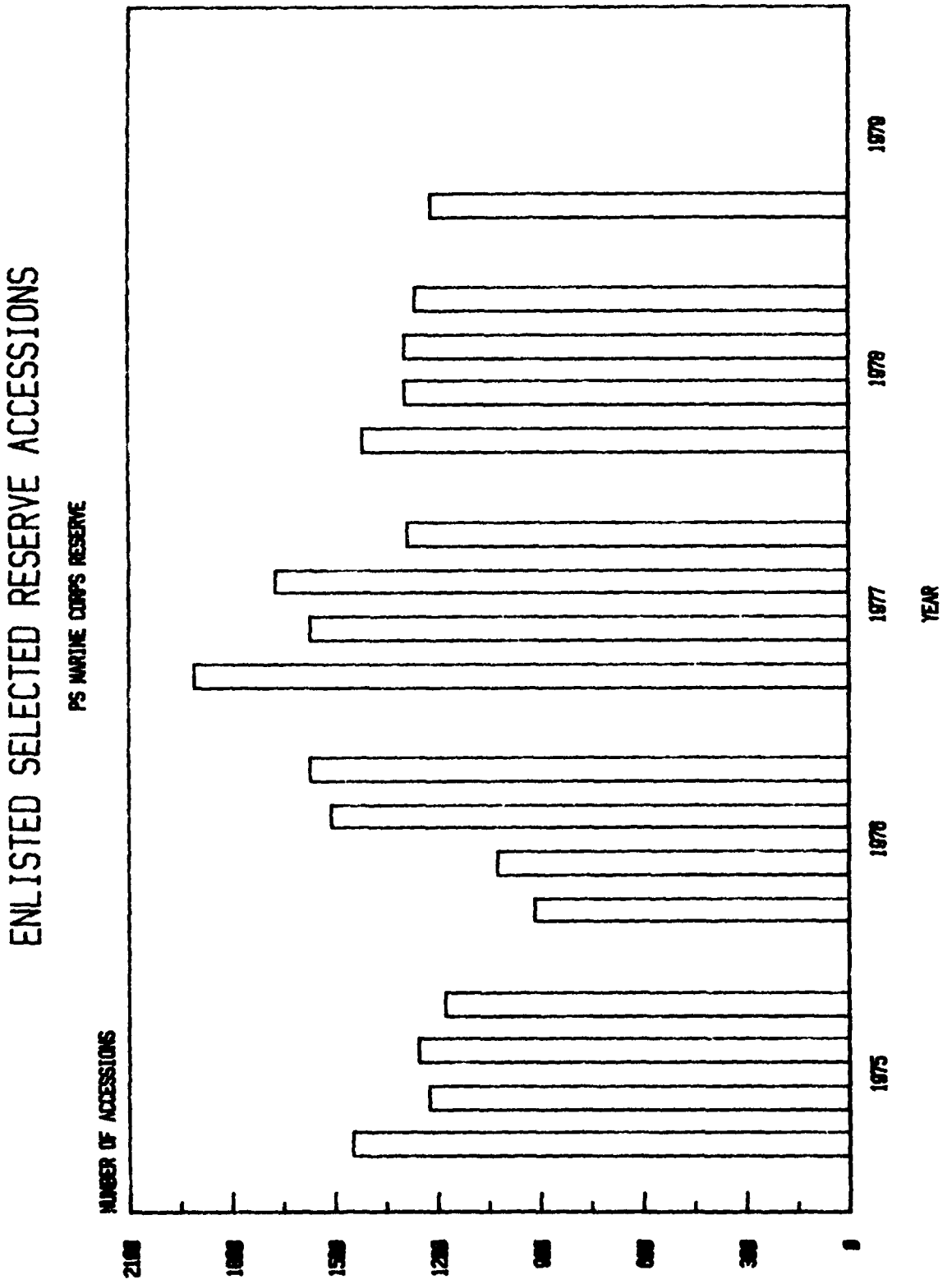
ENLISTED SELECTED RESERVE ACCESSIONS
PS MARINE CORPS RESERVE
NUMBER OF ACCESSIONS
2100
1800
1500
1200
900
600
300
0
1975
1976
1977
1978
1979
YEAR

Figure A-10

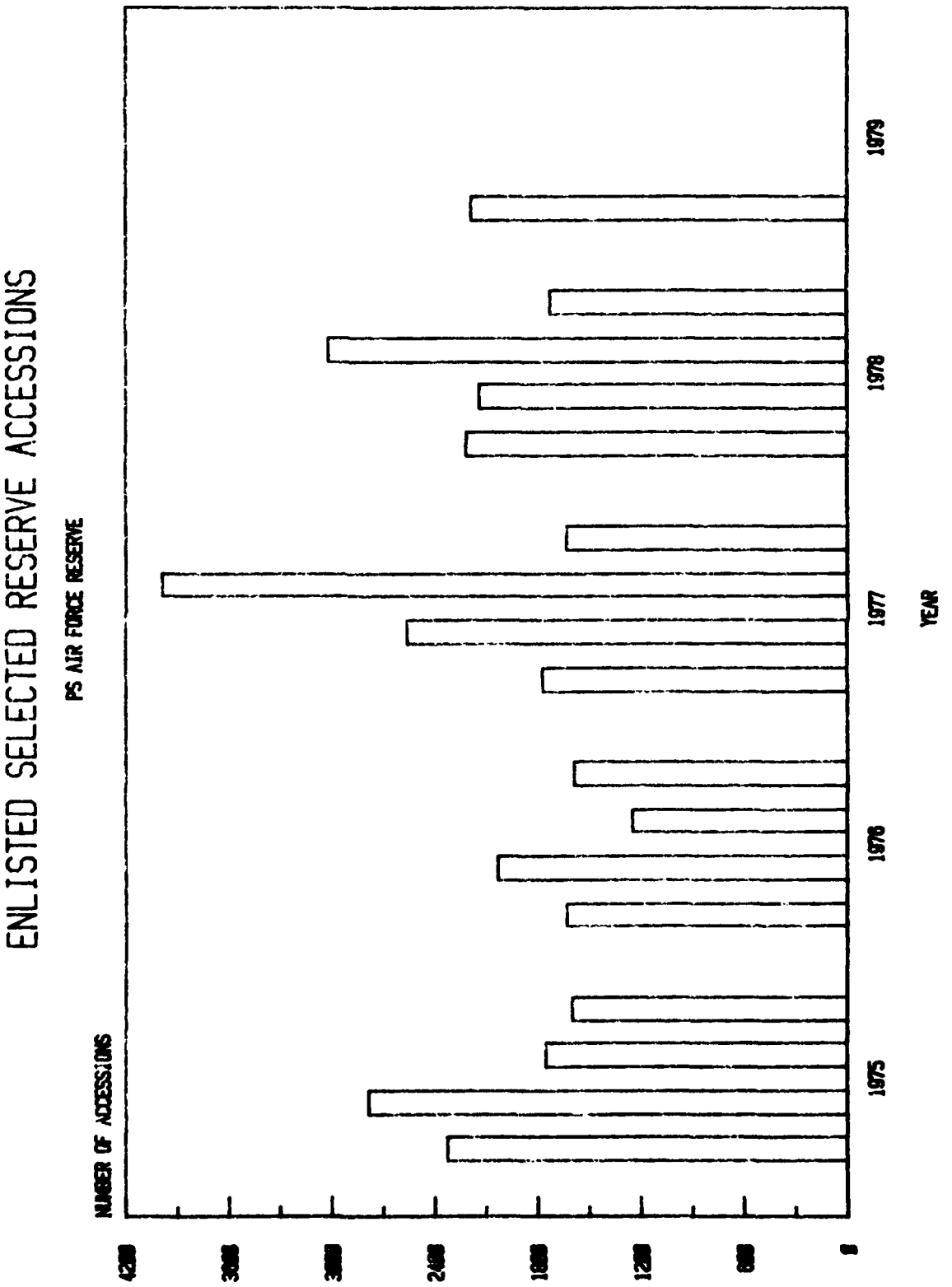
ENLISTED SELECTED RESERVE ACCESSIONS
PS AIR FORCE RESERVE
NUMBER OF ACCESSIONS
4200
3600
3000
2400
1800
1200
600
0
1975
1976
1977
1978
1979
YEAR

Figure A-11

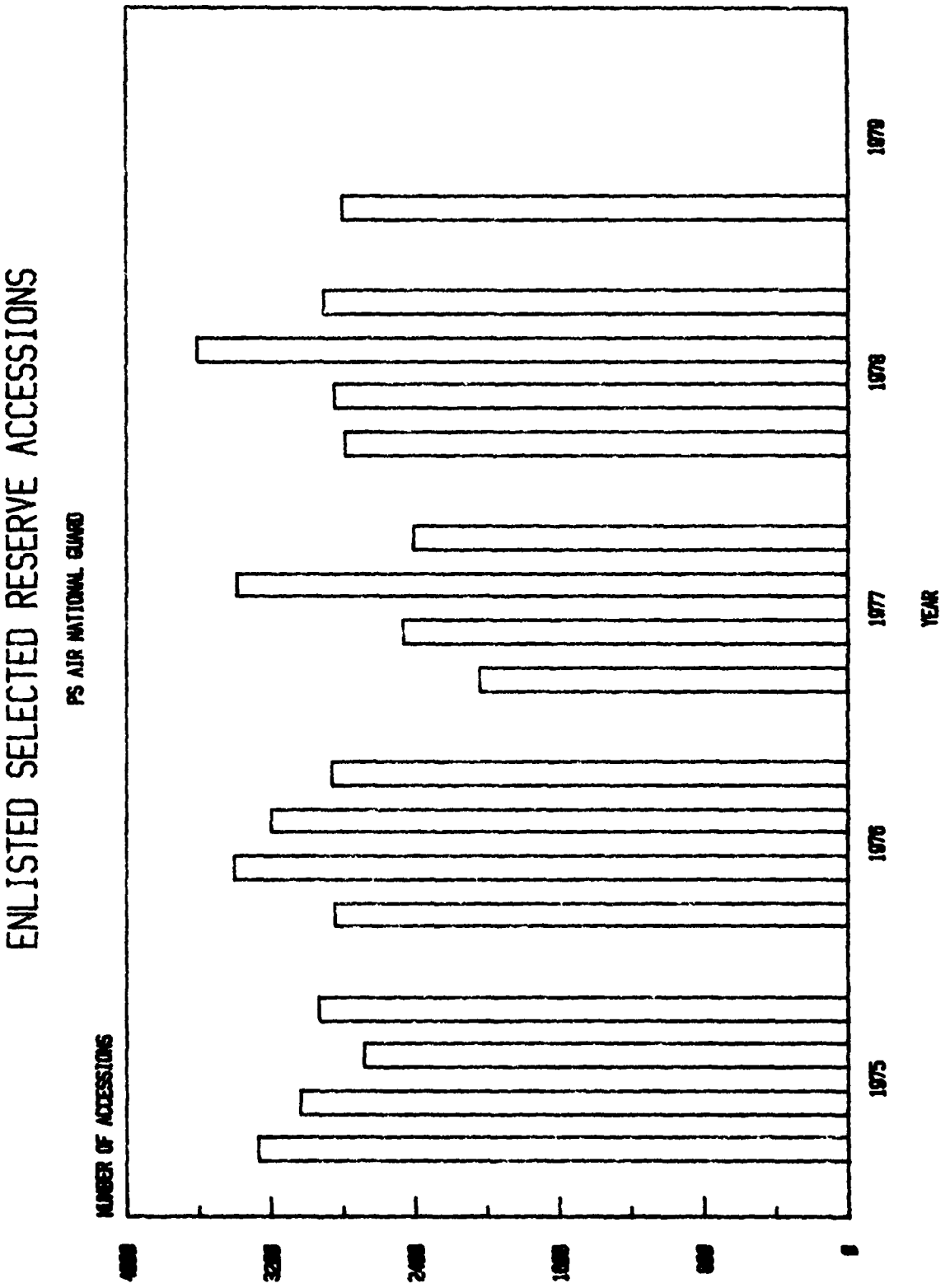
ENLISTED SELECTED RESERVE ACCESSIONS
PS AIR NATIONAL GUARD
NUMBER OF ACCESSIONS
YEAR
1975
1976
1977
1978
1979

Figure A-12

Appendix B
INDIVIDUAL COMPONENT SUPPLIES OF NPS AND PS ACCESSIONS

Another obvious procedure for constructing reserve supply projections would be the analysis of accessions figures of each individual reserve component. This appendix will show that the results of this analysis do not differ significantly from the DoD results presented in Section III.

We will use a simple dichotomous logit technique to estimate each of the individual component supply equations. Strictly speaking, the correct technique for this problem is multinomial logit analysis in which each component represents only one option among a set of reserve choices open to a prospective recruit. However our main purpose in this section is to test for differences in coefficients across component equations. Although this test can be accomplished within the multinomial framework, it requires sophisticated computer software.* By restricting our analysis to the dichotomous logit model, this test reduces to a very simple Chow test across pairs of equations.

Estimating NPS-Accessions--Individual Component Supplies

Reestimation of Equation 5 using each component's observed supply A_i rather than the DoD-wide total gives additional insights into the nature of the reserve supply function. Table B-1 presents the results of this procedure.

With the exception of the Marine Corps Reserve pay variables, the signs of all coefficients are as expected. The coefficients for unemployment rate have the expected signs in each case and are significant in four of six components. The coefficients of determination range from a low of .382 for the Marine Reserve to a high of .754 for the National Guard and are much below that observed in the DoD analysis.

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*For an example of testing coefficients across equations in a multinomial logit model, see Bryan Ellickson, *Economic Analysis of Urban Housing Markets:* A New Approach," The Rand Corporation, R-2024-NSF, July 1977.

Table B-1

NON-PRIOR SERVICE REGRESSION RESULTS

	ARNG	USAR	USNR	USMCR	ANG	USAFR
Constant	-3.217 (-1.06)	-23.212 (4.81)	-18.829 (-2.37)	-7.789 (-1.42)	-14.156 (4.60)	-11.867 (-1.58)
Primary civilian wage	-1.503 (-1.93)	3.189 (2.55)	2.009 (0.97)	-.6353 (-0.45)	.6787 (0.85)	-.1506 (-0.08)
Unemployment rate	.0304 (1.44)	.1325 (3.96)	.1105 (2.54)	.0446 (1.29)	.0836 (4.26)	.0844 (2.09)
Quarter 1 (Jan/Mar)	.3483 (3.81)	.1241 (0.78)	.1077 (0.48)	.3177 (2.04)	.3898 (4.04)	.5323 (2.41)
Quarter 2 (Apr/Jun)	.0804 (0.83)	.4290 (2.70)	.1698 (0.73)	.2852 (1.79)	.3980 (4.04)	.4505 (1.94)
Quarter 3 (Jul/Sep)	.1219 (1.25)	.1111 (0.67)	.2379 (1.05)	.0924 (0.56)	.2495 (2.47)	.2131 (0.88)
Time trend	.1603 (2.25)	-.2525 (-2.21)	-.2040 (-1.08)	.0638 (0.50)	-.0557 (-0.77)	.0191 (0.11)
R^2	.754	.666	.413	.382	.736	.550
Durbin-Watson statistic	1.48	1.55	1.04	1.25	1.57	1.25
Standard error	.163	.270	.384	.269	.162	.343
Observations	25	25	25	25	25	21
Unemployment elasticity	.42	1.81	1.51	.61	1.14	1.15

NOTE: t statistic in parentheses.

The unemployment elasticities associated with these results are shown in the bottom row of Table B-1. They range from .42 for the Navy Reserve to 1.81 for the Army Reserve. Although this range bounds our .63 estimate from the DoD analysis, four of the six elasticities exceed our DoD-wide value. Additional analysis could well show that reserve projections ought to use elasticities derived from data unique to the component in question. At this point, we feel the individual component results are not satisfactory enough to justify their use in the projections methodology. We show these individual elasticities to give the reader a sense of the possible magnitude of the variation in the unemployment elasticity and to show the need for additional analysis of reserve supply behavior.

We are also concerned about the accuracy of the reserve data itself. We expect that measurement errors are larger in earlier observations of our sample. Consequently, we reran all six equations on a sample limited to the period 1975 I to 1979 I. Table B-2 compares the standard errors which result from full and reduced sample estimations.* It does not appear that our model fits the data any better in the shorter period. This suggests that the 1108 data from 1973 and 1974 is of unexpected reliability. In other words, reserve data for the early 1970s suffers not so much from its lack of quality as its lack of quantity, i.e., detail about accession rates of different types of reservists.

Table B-2

COMPARISONS OF STANDARD ERRORS BETWEEN ALTERNATIVE TIME PERIODS

	1973 I - 1979 I	1975 I - 1979 I
ARNG	.163	.164
USAR	.270	.182
USNR	.384	.344
USMCR	.269	.169
ANG	.162	.161

*We omit the Air Force Reserve from this comparison because of the errors in the FY77 figures.

Finally we examined the complexity of the reserve supply function across components. Table B-3 shows the F statistic obtained under the null hypothesis that the coefficients of Equation 5 are identical across components. Using a 5 percent confidence level in the 15 possible comparisons, we reject the null hypothesis only for the comparisons of the Army Reserve with the Navy Reserve and the Army Guard. This similarity in behavior across the reserve components supports our decision to place principal reliance on DoD-wide supplies instead of individual component supplies.

Table B-3

COMPARISONS OF THE RESERVE SUPPLY FUNCTION BETWEEN COMPONENTS

	USAR	USNR	USMCR	ANG	USAFR
ARNG	2.70*	2.05	0.96	0.89	0.45
USAR	--	2.88*	1.89	1.61	1.10
USNR	--	--	1.15	1.25	0.94
USMCR	--	--	--	0.18	0.17
ANG	--	--	--	--	0.21

*Significant at the 5 percent level.

Estimating PS Accessions

The 1108 report contains even less information about PS accessions than about NPS accessions.* Because the 1108 report did not differentiate PS accessions by sex, all PS analysis in this Rand note includes both males and females. Our sample is restricted by the available data and varies between components. In all cases, the sample starts in a quarter between 1974 III and 1975 I. Appendix A contains graphs of the PS values used in the analysis.

*In the Army Reserve case, 1108 report did not include PS accessions until 1976. We therefore have used RCCPDS PS figures for all observations for this component. Because of potential inaccuracies in the early RCCPDS data due to "start-up" problems, Army Reserve results may be suspect.

Table B-4

PRIOR SERVICE REGRESSION RESULTS

	ARNG	USNR	USMCR	ANG
Constant	.8126 (0.28)	-17.308 (-2.98)	-3.725 (-0.94)	-11.282 (-3.16)
Primary civilian wage	-1.985 (-2.65)	2.816 (1.79)	-1.807 (-1.72)	1.014 (1.08)
Unemployment rate	.0424 (0.80)	.1301 (1.24)	.1829 (0.97)	.0118 (0.18)
Quarter 1 (Jan/Mar)	.1404 (1.71)	-.1613 (-0.85)	.1456 (1.13)	-.0952 (-0.89)
Quarter 2 (Apr/Jun)	-.1000 (-1.10)	-.3711 (-1.77)	-.0001 (-0.01)	-.0086 (-0.08)
Quarter 3 (Jul/Sep)	.1264 (1.56)	.1374 (0.82)	.0685 (0.54)	.0408 (0.40)
Time trend	.1624 (2.36)	-.296 (-2.05)	.1948 (1.84)	-.1125 (-1.30)
R^2	.792	.663	.377	.452
Durbin-Watson statistic	1.51	1.61	1.00	2.02
Standard error	.128	.283	.181	.164
Observations	19	19	17	19
Unemployment elasticity	.21	.66	.95	.06

NOTE: t statistics in parentheses.

The final form of our regression is identical to Equation 5 except that overall unemployment rates replace the unemployment rates of 16 to 24 year old males and the eligible pool of enlistees is no longer the male civilian population of 17 to 24 year olds, but is the total pool of Vietnam-era veterans. Again we rely upon the logistic function to restrict our estimated enlistment propensities between 0 and 1. Data errors have forced us to drop the Army Reserve and Air Force Reserve from the PS analysis.*

Table B-4 shows the results of the regression procedure. The results of our PS regressions are not as robust as the NPS results. The coefficients of determination range from .377 to .792. The limited number of observations probably contributes to our low t statistics. The sign of the civilian wage variable is incorrect in 2 of 4 cases. The unemployment elasticities implied by these results are shown in the last line of Table B-4. Their range is wide and none is statistically distinct from 0.

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*The charts in Appendix A contain the published accession values for these two components. These published figures are incorrect for the years of FY76 in the Army Reserve and FY77 in the Air Force Reserve.

Appendix C

NUMERICAL VALUES OF PROJECTIONS FOR ALL COMPONENTS

TABLE C-1. PROJECTIONS OF NATIONAL GUARD MALE NPS ACCESSIONS (CATEGORY I-III), 1979-1990

Calendar Year	Low Growth	Moderate Growth	High Growth
1979	30504	30504	30504
1980	31936	31936	31936
1981	31933	31574	30971
1982	31853	30284	28157
1983	31330	29340	25702
1984	30715	27959	24969
1985	30040	27343	24419
1986	29346	26710	23854
1987	28902	26232	23427
1988	28820	25896	23127
1989	27836	25338	22628
1990	27212	24767	22120

TABLE C-2. PROJECTIONS OF ARMY RESERVE MALE NPS ACCESSIONS (CATEGORY I-III), 1979-1990

Calendar Year	Low Growth	Moderate Growth	High Growth
1979	9014	9014	9014
1980	9438	9438	9438
1981	9437	9331	9152
1982	9413	8949	8321
1983	9259	8670	7596
1984	9077	8262	7379
1985	8877	8080	7216
1986	8672	7893	7049
1987	8517	7752	6923
1988	8408	7653	6834
1989	8226	7488	6687
1990	8042	7319	6537

TABLE C-3. PROJECTIONS OF NAVY RESERVE MALE NPS ACCESSIONS (CATEGORY I-III), 1979-1990

Calendar Year	Low Growth	Moderate Growth	High Growth
1979	2111	2111	2111
1980	2210	2210	2210
1981	2210	2185	2143
1982	2204	2096	1948
1983	2168	2030	1779
1984	2125	1935	1728
1985	2079	1892	1690
1986	2031	1848	1651
1987	1994	1815	1621
1988	1969	1792	1600
1989	1926	1753	1566
1990	1883	1714	1531

TABLE C-4. PROJECTIONS OF MARINE CORPS MALE NPS ACCESSIONS (CATEGORY I-III), 1979-1990

Calendar Year	Low Growth	Moderate Growth	High Growth
1979	7387	7387	7387
1980	7734	7734	7734
1981	7733	7646	7500
1982	7714	7334	6819
1983	7587	7105	6224
1984	7438	6770	6047
1985	7275	6622	5914
1986	7107	6468	5777
1987	6979	6352	5673
1988	6890	6271	5601
1989	6741	6136	5480
1990	6590	5998	5357

TABLE C-5. PROJECTIONS OF AIR NATIONAL GUARD MALE NPS ACCESSIONS (CATEGORY I-III), 1979-1990

Calendar Year	Low Growth	Moderate Growth	High Growth
1979	2473	2473	2473
1980	2589	2589	2589
1981	2589	2560	2511
1982	2583	2455	2283
1983	2540	2379	2084
1984	2490	2267	2025
1985	2436	2217	1980
1986	2379	2166	1934
1987	2337	2127	1899
1988	2307	2100	1875
1989	2257	2054	1835
1990	2206	2008	1794

TABLE C-6. PROJECTIONS OF AIR FORCE RESERVE MALE NPS ACCESSIONS (CATEGORY I-III), 1979-1990

Calendar Year	Low Growth	Moderate Growth	High Growth
1979	1351	1351	1351
1980	1415	1415	1415
1981	1414	1399	1372
1982	1411	1341	1247
1983	1388	1300	1138
1984	1360	1238	1106
1985	1331	1211	1082
1986	1300	1183	1057
1987	1277	1162	1038
1988	1260	1147	1024
1989	1233	1122	1002
1990	1205	1097	980

TABLE C-7. PROJECTIONS OF NATIONAL GUARD PS ACCESSIONS 1979-1985

Calendar Year	Low Growth	Moderate Growth	High Growth
1979	45637	45637	45637
1980	46163	46163	46163
1981	45692	45368	44879
1982	45383	44254	42484
1983	44911	43315	40446
1984	44438	42231	39865
1985	43965	41782	39441

TABLE C-8. PROJECTIONS OF ARMY RESERVE PS ACCESSIONS 1979-1985

Calendar Year	Low Growth	Moderate Growth	High Growth
1979	36882	36882	36882
1980	37307	37307	37307
1981	36927	36665	36270
1982	36677	35765	34334
1983	36295	35006	32687
1984	35913	34130	32218
1985	35531	33767	31875

TABLE C-9. PROJECTIONS OF NAVY RESERVE PS ACCESSIONS
1979-1985

Calendar Year	Low Growth	Moderate Growth	High Growth
1979	15887	15887	15887
1980	16152	16152	16152
1981	16070	15957	15785
1982	16047	15647	15021
1983	15965	15398	14378
1984	15883	15094	14248
1985	15801	15016	14175

TABLE C-10. PROJECTIONS OF MARINE CORPS PS ACCESSIONS
1979-1985

Calendar Year	Low Growth	Moderate Growth	High Growth
1979	5249	5249	5249
1980	5310	5310	5310
1981	5256	5218	5162
1982	5220	5090	4887
1983	5166	4982	4652
1984	5111	4858	4585
1985	5057	4806	4537

TABLE C-11. PROJECTIONS OF AIR NATIONAL GUARD PS ACCESSIONS 1979-1985

Calendar Year	Low Growth	Moderate Growth	High Growth
1979	12009	12009	12009
1980	12046	12046	12046
1981	11820	11737	11611
1982	11638	11348	10894
1983	11412	11007	10277
1984	11186	10631	10035
1985	10961	10416	9833

TABLE C-12. PROJECTIONS OF AIR RESERVE PS ACCESSIONS 1979-1985

Calendar Year	Low Growth	Moderate Growth	High Growth
1979	9061	9061	9061
1980	9147	9147	9147
1981	9034	8841	8874
1982	8954	8731	8382
1983	8841	8527	7962
1984	8728	8295	7830
1985	8615	8187	7729


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